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Volume II

Garrity-Sandage Associates, Inc, Mason City, Iowa

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HAZARDOUS SUBSTANCES AND PESTICIDE SURVEY AND TRAINING PROGRAMS

Prepared for

Iowa Department of Public Instruction
Office of Planning and Programming
Iowa Department of Agriculture
Job Service of Iowa*
U.S. Environmental Protection Agency
Iowa Department of Environmental Quality

VOLUME II

Submitted by

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*formerly Iowa Employment Security Commission

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As a result of the survey in Volume I of this report, Volume II describes the curriculum development designed to assist vocational agriculture teachers and other volunteer group leaders on pesticide handling and disposal of containers. Two pilot modules are included on: 1) Recognition and Use of Paints and Solvents, and 2) Health Considerations in the Use of Paints and Solvents.

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Dear Reader:

It is my pleasure to transmit to you the "Special Substances Report 1977," Vols. I & II. This work was performed by the North Iowa Area Community College in Mason City pursuant to a contract between NIACC and the following state agencies: Iowa Department of Public Instruction, Office for Planning and Programming, Iowa Department of Agriculture, Job Service of Iowa, U.S. Environmental Protection Agency and Iowa Department of Environmental Quality.

It must be pointed out that the conclusions, recommendations and observations contained in this report are those of NIACC and not necessarily that of the other contracting agencies. Nevertheless, the completion of this report in my opinion represents an important step towards proper special wastes management in Iowa and it is my hope that this report will be useful in providing a better idea of the special wastes situation in our state.

I would like to conclude by extending special thanks to the industries that participated voluntarily in this effort.

Sincerely,

Larry E. Crane

Larry E. Crane
Executive Director

LEC/BZK/kg

3920 Delaware Ave., P.O. Box 3326, Des Moines, Iowa [illegible]

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FOREWORD

For a more comprehensive understanding of the entire scope of this study, the reader should review Volume I, "Industrial Special Wastes Generated in Iowa and Manpower Characteristics of Employee Handlers." The following brief narrative will describe only those concerns that are related to curriculum development.

The contract required (1) curriculum development designed to assist vocational agriculture teachers and other volunteer group leaders on pesticide handling and disposal of containers and (2) the development and instruction of two pilot modules which were supported by the study.

Limited copies of this publication are available without charge from the Assistant Dean of Instruction, North Iowa Area Community College, Mason City, Io[illegible] 50401.

ACKNOWLEDGMENTS

William McKeown served as Assistant Project Officer for the contract and coordinated the resources of the college with Garrity-Sandage Associates, Inc., the subcontractor, who assumed the major role for conducting the study, recommending instructional modules for Volume II, Part II, writing Volume I and editing the entire report.

John Rothamel was helpful with advice and counsel throughout the entire project.

Staff from the Department of Environmental Quality including Charles Miller, B. Z. Karachiwala, Dr. Michael Hanson, Ron Kolpa and Tim Kaiser and from the Department of Public Instruction including Dr. William Baley and Don Wederquist all supplied technical assistance and helpful comments.

Staff from the Region VII Office of the United States Environmental Protection Agency including Jack Coakley and Dr. Max Wilcomb supplied support and encouragement and met with us on several occasions.

Dean Nerdig, Alf Oines, Al Hasselman and Roger Holcomb prepared the Pesticide Can Recycling curriculum and the agricultural staff presented six seminars to agricultural instructors in Iowa.

Ramona Cotton and Connie Blietz assisted by Roger Holcomb and Noreen Coyan prepared and taught two pilot instructional modules in an area industrial plant.

David R. Pierce

Dr. David R. Pierce, Project Director

INTRODUCTION

The contract required (1) curriculum development designed to assist vocational agriculture teachers and other volunteer group leaders on pesticide handling and disposal of containers and (2) the development and instruction of two pilot modules which were supported by the study.

Pesticide Handling and Disposal of Containers

Discussions with the Department of Environmental Quality (DEQ) and the Department of Public Instruction (DPI) during the initial proposal development phase indicated an interest on their part to develop and pilot test a curriculum which would be designed to assist vocational agriculture teachers and other volunteer group leaders on pesticide handling and disposal of containers.

There has been a substantial increase in the use of pesticides in production agriculture in Iowa while the number of satisfactory alternatives for disposal has been rapidly decreasing. Dumps are being closed, landfills are refusing unrinsed containers, hazards of indefinite storage or reuse are being recognized and unrinsed containers are difficult to handle.

Continued discussions with the DPI and the DEQ led to the conclusion that six regional seminars would reach all of Iowa's vocational agriculture instructors and this would be the most effective way to implement an educational program. The DPI each year conducts workshops in six locations in order to reach all secondary and post-secondary vocational agriculture instructors. Two hours were scheduled during each of the six workshops for the instruction on pesticide handling and disposal of containers.

There are 243 Future Farmers of America (FFA) Chapters among Iowa's 450 school districts and the secondary student members of such chapters are interested in public service projects. Thus it was felt that some chapters may wish to undertake a community disposal project involving proper rinsing, crushing and disposal of used pesticide containers.

The six workshops were conducted on April 6, 7 and 8, 1976 in six different locations in Iowa with most of the secondary vocational agriculture instructors in attendance.

A follow-up of the Pesticide Container Disposal seminars was accomplished at a Department of Public Instruction sponsored Vocational Agriculture workshop in Des Moines, Iowa, in July 1976. The 243 schools were invited to attend and 115 forms were voluntarily completed.

The results after approximately three months indicated 63 educational meetings had been conducted with 1,527 in attendance. Eleven FFA chapters had sponsored a Drain, Rinse and Crush program and had collected a total of 97,760 pounds of crushed pesticide containers.

Ten chapters were successful in selling the crushed containers, three disposed of them at a landfill and two buried them elsewhere. Forty-three chapters indicated they planned to conduct a crushing program during the 76-77 school year and 60 did not plan such a program.

The reasons given for not getting involved include risks relating to profit, availability of outlets, liability risks and safety because some containers are not properly rinsed. Other reasons included comments indicating many landfills and salvage yards will not accept the crushed cans.

Suggestions for improving the program included a need for a more suitable can crusher and more accessible disposal locations and collection stations.

A number of instructors indicated there were problems related to the disposal of rinse water and a loss of student interest when school was over.

Study Supported Pilot Modules

One of the six major objectives of the study was to determine the need for short-term training programs for industry in the handling of hazardous materials.

Appropriate background material resulting from the study relating to what should be taught and recommended delivery considerations are reproduced from pages 52 and 53 of Volume I.

"... *What Should be Taught? More than half of all employers in the survey indicated their employees needed to improve their competency level in the areas of occupational health; handling, storage and disposal of hazardous substances; recognition and use; and/or in the transportation of such materials. Employees agreed with their employers on this finding.*

In order to accommodate the wide variances between industries and their processes and the raw materials currently contributing to the hazardous waste stream, training programs should be developed around substances common to many industries. This approach would accommodate diverse industries - both large and small - by recognizing a common bond similar to training for specific job functions. Substances contributing to the hazardous materials stream in Iowa should be identified and grouped harmoniously for module development.

Training plans should then be developed which describe the knowledge of skill topics to be taught and the method or methods by which the training will be given. These plans should address training for both supervisory and less than supervisory with clearly defined course objectives for each group. The life cycle of the substances from generation to proper disposal should be covered. Learners should be able to recognize potentially hazardous situations and to understand and interpret specific information pertinent to the substances. A typical module may have several submodules in order to address the entire life cycle of the substances being studied. A do and don't approach should be taken with practical problem solving as a methodology.

How Should Training be Delivered? Training may be accomplished through a variety of methods or combinations of methods. Once modules with basic information have been developed, supplemental materials and techniques may be employed to adjust the level and scope of the presentations for supervisory or less than supervisory personnel.

Ideally in large plant operations, existing training programs may be utilized and the training offered at the plant site. During the interview process, employers continually indicated they would use training only if it were specific enough to their operation. The development of training plans for a specific plant should be directed not only toward the materials or substances involved, but through the use of supplemental material toward the industrial processes and technologies employed in the operations. "In-house" training may be provided by qualified employees using the basic modules. However, if this approach is used, training schedules should be developed and used, and instructors should be experienced in teaching and have received some assistance in selection and development of supplemental materials.

Special programs may be needed for small industries or consortiums of firms. The study shows that in sheer numbers there are more small firms who use special substances and generate special wastes than there are large firms. The study also shows more employees in small firms indicate a need for training than do those in large firms.

Training programs for these firms will probably have to be offered on community based college campuses throughout the State. Logistic problems may be more difficult to cope with since time and travel factors will be considered.

A training plan for a consortium of small firms will need to take into consideration, to the extent practical, the manufacturing processes and job requirements of the majority of those to be trained. Job categories will not be as clearly defined in small firms as in large companies. It should be possible, however, to develop a listing of tasks or job functions most generally performed in the daily contact of the hazardous materials or substances being encountered. Circumstances of the encounter will probably vary more often than those in large firms and should be considered in the development of supplemental materials. Flexibility of instructional materials and format as well as the abilities of the instructor to accommodate specific needs of trainees is crucial. For these reasons, the writers conclude training for smaller industries in Iowa can probably best be delivered through a community based college and should be developed around substances common to many industries as opposed to job skill training more commonly given..."

RECOMMENDATIONS

Pesticide Handling and Container Disposal

It is interesting to note the number of constructive suggestions relating to improvement of the pesticide container recycling program are few in comparison to the large number expressing concern for safe handling of pesticide cans. Safe handling of cans by students is based on the premise that the farmer will properly triple rinse each can but the survey indicates this premise is not presently reliable.

Based on the results of 115 follow-up surveys completed by secondary vocational agriculture instructors, the following recommendations are offered:

- Iowa's vocational agriculture teachers should be surveyed again. The follow-up survey conducted in July 1976 was too soon after the six seminars. A follow-up survey at this time would give much more information regarding success, failures, problems and suggestions for improving secondary student participation in a can recycling program.
- All metal containers should be registered and include a deposit by the dealer to assure their return. In addition, the applicator should be required to triple rinse all returned cans including a hole to be punched in the bottom of each can to assure proper rinsing and prohibit reuse. We feel the dealer has a significant responsibility in any successful recycling program.
- All applicators should be licensed and required education should be included as a part of the licensure procedure.

Study Supported Pilot Modules

Based on the study results, the recommendations of the advisory council and the experience gained from instructing the two pilot modules, the following recommendations seem appropriate:

- Additional instructional modules should be developed in the areas of (1) Handling, Storage and Disposal and (2) Transportation.
- Instruction for personnel in large plants should be on-site, short duration sessions and offered during or immediately following normal working hours.
- Instruction for employees of small industries should be offered at a location within easy driving distance.
- Training programs should be developed around substances common to many industries since the course design will very likely be similar.

PART I

PESTICIDE CONTAINER RECYCLING

ACKNOWLEDGMENTS

Without the help of the Iowa Department of Environmental Quality, Iowa Department of Public Instruction and the Iowa Fertilizer and Chemical Dealer Association, it would have been impossible to put this program together. Each of the above organizations provided assistance in assembling the program and guided in selecting the material to be presented.

Elvin Hasselman, Alf Oines, Charles Maxon and Roland Bjorklund spent many hours in editing and also shared in presenting the seminars. Gerald Barton and the Iowa Vocational Agriculture Instructors played an important role in evaluating the program.

A very special thanks to Donald Wederquist of the Iowa Department of Public Instruction and Tim Kaiser representing the Iowa Department of Environmental Quality for their encouragement and assistance.

To all these individuals, companies and others too numerous to mention, a special thank you.

PREFACE
(To the Instructor)

The major emphasis of this program is the method of decontamination and alternatives for the disposal of used and empty farm pesticide containers.

The target audience is agriculture farm chemical suppliers, farmers and scrap metal dealers. It is the hope of the authors that the presenter of this program will acquaint himself with the Department of Environmental Quality of Iowa, State laws that cover disposal of pesticide containers and proper methods of container rinsing.

We also suggest that this prepared program be used only as a guide for the presenter's use and that he add and subtract from the program so that it will be better adapted to his locality.

PESTICIDE CONTAINER RECYCLING

Background Information

The contract specifically required 1) the preparation of a course outline and development of instructional materials for use in conducting seminars on pesticide handling and disposal of containers; 2) presenting six seminars for vocational agriculture teachers and other volunteer group leaders on pesticide handling and disposal of containers; and 3) a follow-up with seminar participants to determine the adequacy of the training including recommendations regarding changes for future seminars and considerations for regulatory changes.

Discussions during the proposal development phase indicated a strong interest and need to do something about the pesticide can disposal problem in Iowa. The Department of Environmental Quality (DEQ) had already developed some curriculum materials which were later incorporated in the final training package.

Continued discussions with the Department of Public Instruction (DPI) and the DEQ led to the conclusion that six regional seminars would reach all of Iowa's vocational agriculture instructors and this would be the most effective way to implement an educational program to deal with empty pesticide cans. There are 243 Future Farmers of America (FFA) Chapters among Iowa's 450 school districts and the secondary student members of such chapters are interested in public service projects. The DPI each year conducts workshops in six locations in order to reach all secondary and post-secondary vocational agriculture instructors. The decision to schedule approximately two hours during each workshop for the presentation of pesticide handling and disposal of containers turned out to be a good decision.

Curriculum Development and Instruction

The DEQ and DPI were generous with technical assistance to the Agriculture Department and Community Education Division of North Iowa Area Community College. The seminar materials were developed in early 1976 and the six seminars were conducted according to the schedule and agenda listed below:

Date	Instructor	District	Location of Meeting
April 6	Oines	NE	Strawberry Point - Starmont Comm School Voc Ag Room. School 6 miles west of Strawberry Point on Highway 3
April 6	Nerdig	SW	Atlantic - at country club, south of Atlantic on South Chestnut Street off Highway 6
April 7	Hasselman	SE	Washington - Captains Table Restaurant on Highway 92

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PESTICIDE CONTAINER RECYCLING

Date	Instructor	District	Location of Meeting
April 7	Nerdig	NC	Clarion - Voc Ag Room, east side of high school
April 8	Hasselman	SC	Indianola - Voc Ag Building west of high school
April 8	Oines	NW	Cherokee - Caravan Motel & Restaurant, west of Jct. Highway 3 & 59 on Highway 3

AGENDA

4:30 P.M.	Pesticide container handling, disposal, recycling Slides and Script by team from NIACC, Area II, Mason City, to comply with the United States Environmental Protection Agency standards.
6:00 P.M.	Dinner
7:00 P.M.	Discussion and distribution of pesticide material presented.
8:00 P.M.	Secondary Instructor meeting - District FFA Advisors (15 minutes); Instructional Materials - On-going Programs, Post-Secondary Veterans instructors' meetings.
9:00 P.M.	Adjournment

A complete packet of seminar materials including a slide script program was distributed to each secondary vocational agriculture department, 15 area schools and all participating agencies to the contract.

The next section displays a representative sample of the seminar materials including the narrative script.

HAZARDOUS SUBSTANCES AND PESTICIDES SURVEY AND TRAINING PROGRAM

Prepared for

Iowa Department of Public Instruction
Office of Planning and Programming
Iowa Department of Agriculture
Job Service of Iowa*
U.S. Environmental Protection Agency
Iowa Department of Environmental Quality

By

North Iowa Area Community College
Community Education Division
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The preparation of this document was financially aided through Contract Number 76-4300-01 with the Iowa Department of Environmental Quality, the Iowa Department of Public Instruction, the Office for Planning and Programming, the Iowa Employment Security Commission, the Iowa Department of Agriculture and the United States Environmental Protection Agency.

*formerly Iowa Employment Security Commission

Packet Material

1. Script "Disposal of Pesticides and Containers"
2. Iowa Poison Information Centers
3. Chemical-Cartridge Respirators approved for pesticide or organic vapors
4. Owners of Kan Krushers in Iowa
5. How Does a Local Group Organize?
6. List of possible crushed can buyers.

Above material available from:
North Iowa Area Community College
500 College Drive
Mason City, IA 50401

7. Diagnosis and Treatment of Poisoning by Pesticides
8. Some Answers on Certification of Pesticide Applicator
9. An Overview of Pesticide Applicator Certification
10. Standards for Certification of Pesticide Applicators
11. You can Poison Yourself, Your Family, Your Livestock
12. The Federal Environmental Pesticide Control Act of 1972 Highlights

Above material available from:
U.S. Environmental Protection Agency
Office of Pesticide Programs
Washington, D. C. 20460

13. Drain and Rinse Ag Chemical Containers

Above material available from:
Iowa Fertilizer and Chemical Association
541 31st
Des Moines, IA 50312

14. Your Chemical Storage Handbook

Above material available from:
Iowa State University
Ames, IA 50013

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Objectives of the Pesticide Safety and Container Disposal Seminars

1. The major emphasis of this program is the method of decontamination and the alternatives for the disposal of used, empty pesticide containers. The approximate ratio of pesticide decontamination and disposal information to pesticide use and handling information should be about 3 or 4:1 (70-80% disposal; 20-30% handling).

2. This information should point out: A) proper storage - locked, inside warehousing of both empty and full containers; B) the importance of the label in showing such things as how the product can be used, on what pests, under what conditions, and what precautions must be taken during and after use; C) what to do in case of an accidental spill or other emergency situations (spills - call 515-288-6819 for DEQ notification and assistance; poisonings - call poison control hospital, list included); D) applicator certification could be mentioned.

3. The decontamination and disposal aspect should specifically outline the rinsing procedure for metal, glass, and plastic containers. The number one goal of the program is to educate users of pesticides on how to decontaminate the empty containers. It should be brought out that rule 400-4.2 (455B), Iowa Administrative Code, does not allow the open burning of paper or plastic containers. As an alternative to burning, DEQ suggests that paper be put in a secondary leak-proof container and taken to a landfill for burial. Paper bags should, if possible, be rinsed before burial.

4. Alternatives for disposal of the cans, once they are rinsed, include burial at a sanitary landfill, crushing and recycling the containers as scrap metal or glass, and burial of the waste on land owned by the waste generator. The third alternative, while legal, is the least desirable and should be de-emphasized. A) Sanitary landfill burial is the easiest. County landfill policy should be determined before transporting containers to the sanitary landfill. B) Collecting, crushing, and selling steel cans as metal scrap is labor intensive but provides a community service, saves resources, reduces environmental and personal hazards. Any group wishing to have a recycling project should: 1) Handle only rinsed, empty containers, no on-site rinsing should be done; 2) a hole punched in bottom of the container will at least guarantee emptiness; 3) Local medical personnel should be notified that such a project is to be conducted to allow them to obtain necessary information if they don't already have it available; 4) The safety equipment that needs to be worn - long sleeve shirt, unlined rubberized gloves, hat, long pants and cuff high overshoes (pants worn outside shoes). No unwashable items (i.e., belt or watch) should be worn. The clothing should be

changed daily, or immediately if a quantity of pesticide is spilled on the clothing. Goggles or safety glasses should be worn by anyone actually operating the crusher. In addition, a respirator of the type approved for pesticides should be available if containers marked with a "skull and crossbones" and the words "poison-danger" are delivered to the site. Being overclothed tends to lead to a feeling of false security and is probably nearly as dangerous as being underclothed; 5) Occupational Safety and Health Administration (OSHA) rules do not apply in the case of volunteer groups collecting scrap metal as a community service. However, if an accident should occur, a report should be filed with the State OSHA in Des Moines. "Common Sense" safety practices should be followed; 6) This project is not risk-free since a group could be held liable in the event of an accident or property damage. Therefore, only those groups who are very safety-minded should attempt it; 7) Publicizing the program and rinse requirements before collection begins is important to get the containers as you want them; 8) Locate a firm market before the project begins; 9) Determine a collection method - divide the area to be covered into territories, have one day for collection, offer no collection, make a charge for collection and/or disposal to guarantee income for the group; 10) A crusher should be obtained. They can be bought, borrowed, or self-made; 11) Obtain the services of a truck for transportation of the cans to the market; 12) Determine area landfill policy in the event no market is available after collection; 13) The five gallon cans are all steel and weigh about 4 pounds. The one gallon and smaller cans are usually tin-plated steel and cannot be recycled in the same way. Tin-plate is more valuable but contaminates steel in the smelting process. If 15 tons or so of tin-plate steel can be gathered it will have a value of about $60+/ton; 14) DEQ offers assistance and requests notification of such projects. C) The burial of containers on land owned or leased by the generator must be done in an area that is "high and dry" (away from surface or ground water) and away from livestock feeding areas and farm buildings.

5. Glass and plastic containers should also be rinsed. Glass can be recycled if a large quantity can be gathered. However, glass markets are fairly new and the market makes glass unfavorable to recycle. Plastic may not be burned.

6. The main reason that people should rinse their containers is that the number of alternatives for disposal is fast decreasing - dumps being closed, landfills refusing unrinsed containers, litter being outlawed, hazards of indefinite storage or reuse being recognized, water quality

Objectives of the Pesticide Safety and Container Disposal Seminars (Cont'd)

protected by liability of disposer for improper disposal - and unrinsed containers are becoming very difficult to handle.

Summary of the major points to be emphasized in order of importance:

1. The decontamination of metal, glass and plastic containers by rinsing and disposal alternatives.
2. Importance of proper handling and use of pesticides.
3. The recycling program and in-depth information about it.

Narrative Script for Slide Presentations

1.	TITLE: North Iowa Area Community College	
2.	TITLE: Disposal of Pesticides and Containers	NARRATOR:/ Disposal of pesticides and their containers has become a large problem, requiring considerable professional judgment to resolve.
3.	"drain and rinse"	Research conducted by industry and universities indicates that the best solution is a procedure called "Drain and Rinse." The drain and rinse procedure can be very successful if it is performed on the farm at the time the chemical is mixed for application.
4.	3 reasons on tombstones	Safety, economics and disposal are the three reasons for using the "drain and rinse" procedure.
5.	safety	The drain and rinse procedure will remove the potential hazard to livestock and children. It will also reduce the amount of pollution and prepare the containers for proper disposal.
6.	economics	Economics is a major factor in using the drain and rinse procedure. You've paid for that chemical. Don't leave it behind in the container to become a hazard when it should be out in the field doing its job. A five-gallon container could have as much as a half pint of concentrate left in it if the drain and rinse procedure is not practiced.

Narrative Script for Slide Presentations (Cont'd)

7. disposal	By using the drain and rinse procedure, chemical containers are ready for crushing and disposal, minimizing exposure to concentrated residue or contamination of the immediate area. The crushed containers should then be disposed of by recycling or burying.
8. drain 30 seconds	Drain and rinse is a four-step procedure used when the chemical is mixed to avoid loss of time. First, drain for 30 seconds after normal emptying, holding the container verticially. Drain periods should be extended for high-viscosity compounds.
9. rinse three times	The last three steps of the process are to rinse the container three times with a diluent, normally water. Three rinses will remove enough residue to make container safe for disposal.
10. rule of thumb	Approximately one quart will rinse a one-gallon can. A five-gallon can needs one gallon for rinsing, and a thirty or fifty-five gallon can will need a five-gallon rinse. Always add these rinses to the spray tank mix.
11. caution	Remember, never reuse any ag chemical container for any purpose. Your rinses will still leave enough chemical residue to contaminate feed or water, since only approved drum reconditioning plants are able to remove all residue.
12. crush	Plan to crush and dispose of the empty containers as soon as possible after the rinse and drain procedure. After crushing, disposal should be made by recycling to a steel scrap buyer or by burial at least 18 inches deep in an appropriate area of the farm.
13. Public Service	The preceding slides were made available through the Iowa Farm Fertilizer and Chemical Association. Remember, it's our environment, too. So help preserve it by using the drain and rinse procedure before proper disposal of your ag chemical containers.

Narrative Script for Slide Presentations (Cont'd)

14.	crop duster	Some pesticides come in disposable containers and there is a great temptation to burn these at the site of application, since the supposedly empty bags are hard to move to disposal sites. But these pesticides should be chemically neutralized or modified for easy and safe disposal by land burial.
15.	bulldozer in fire	Disposal regulations currently prohibit open burning. Even though this type of disposal is most often used by farmers and agribusinessmen, open burning is currently illegal in our state.
16.	burning in field	
17.	incineration	Another answer may be incineration, a process of chemical conversion. The residue must still be disposed of, however. Having containers incinerated may present a problem, though, since there are no known suitable incinerators in this area for disposal of chemical residue.
18.	outside tanks	This Garner-Davis unit west of Detroit, Michigan, is used for burning liquid combustible wastes.
19.	fire	Since a temperature of 2,000 degrees must be reached to thoroughly destroy the pesticide, open burning may produce unwanted by-products such as the hydrochloric acid released from chlorinated hydrocarbons. These may do additional damage to both the incinerator and the environment.
20.	sanitary landfill	Land burial seems to be the final solution. But landfill sites must be properly designed, located and operated.
21.	dump truck	Not all disposal sites are suitable for waste pesticides and containers, so farmers and applicators must take the time to collect the empty containers, crush and puncture them, and take them to an approved burial site.

Narrative Script for Slide Presentations (Cont'd)

22.	man in smoke	By mismanagement, an operator can present a hazard to himself and the community. He is being exposed to dangerous Aldrin, Dieldrin and Heptachlor dust resulting in his termination. The job is now open and the widow is looking for a new operator.
23.	danger sign	Contact the Department of Environmental Quality before disposing of any pesticide product. All areas of Iowa have access to an approved sanitary landfill, and most will accept pesticide containers. But be certain to notify the local landfill operator before delivery.
24.	Kansas City site	This site has good operation and control, with provisions for surface drainage.
25.	truck with chickens	Knowledge and judgment in the use of land burial can provide sensible answers to a wide range of problems. Millions of chickens in Mississippi were fed dieldrin-contaminated feed and had to be destroyed. It was more of a chicken disposal problem than a dieldrin disposal problem, and there were many other problems before these chickens were properly laid to rest.
26.	ocean dumping	The option of ocean dumping is not exactly realistic for farmers in our states.
27.	hazardous waste disposal	Waste pesticides and containers can be disposed safely and properly when you read the regulations, use good judgment and the available professional resources.
28.	cans by road	The most important requirement is to avoid water pollution.
29.	dump by water	Open dumping is prohibited by law.
30.	mass of cans	There is a great potential here for the reprocessing and reuse of large barrels.

Narrative Script for Slide Presentations (Cont'd)

31. farmers with cans	Iowa farmers use a lot of outdoor pesticides and many containers fail to receive a decent disposal or burial.
32. rinse and drain	Remember that all containers should be cleaned before starting a community disposal project. Even commercial firms will not accept materials that have not been drained and rinsed, even if they are crushed.
33. man punching hole	Each container must be properly prepared for storage and crushing. Remove the pour spout cap and punch a hole in the other end of the container, before storage or before crushing.
34. stack of cans in barn	Empty drained and rinsed containers should be accumulated in a specific area, since it would not be practical to crush small quantities as they are received. You may want to establish specific receiving hours or days.
35. FFA crusher	When a large quantity of readied containers is available, the local FFA chapter or other community group can start their crushing program. The Roland-Story FFA chapter has patented this prototype crusher and sold it to a licensed manufacturer.
36. can in crusher	With all your group know-how, you should be able to devise a satisfactory crushing unit.
37. commercial crusher	A number of commercial firms are currently purchasing crushed, drained and rinsed containers. A list of these firms is included in your packet. Your group will be performing a much needed toxic container disposal program for your community.
38. man at tank on John Deere	Remember that you are dealing with toxic materials and containers. Can you identify the good points and the no-no's in this picture? The man does have on a simple respirator, but does it have the proper filter? He is not wearing any hand or arm protection, and we question whether or not he has eye protection. What would happen if the old sow came charging and hit his improvised step ladder?

Narrative Script for Slide Presentations (Cont'd)

39. pesticides and body	The sow just tipped over the improvised stepladder and the operator spilled chemical. Dermal exposure happens when the chemical comes in contact with the skin. Since he yelled as he was falling, the operator has ingested some of the liquid chemical orally. Respiratory exposure resulted from not having the proper filter on the respirator, allowing fumes to be inhaled; or because the operator may have pulled the respirator off in his attempt to get the sow to hear him.
40. red hands	Without gloves, his hands and arms became irritated, burned and severely infected.
41. red face	His face was exposed to the same hazard, and without goggles, he may have severely burned his eyes.
42. torso	Oral ingestion resulted in severe internal burns, nausea and a severe body rash.
43. read the label!	To prevent these occurrences, know what you are dealing with, by reading the label on the pesticide container.
44. understand the label	Your questions may be answered if you understand all of the information provided on the container label.
45. products	With the large number of ag chemicals and derivatives, keep the rinsed empty container in case of accident. But be sure to dispose of it as soon as you are through with application.
46. degrees of toxicity	Labeling of pesticides has been standardized to help the operator determine the various degrees of toxicity. Low toxicity is identified on the label with the word CAUTION. Moderately toxic chemicals are designated by the word WARNING, and highly toxic chemicals have the work POISON on them, in addition to bearing the skull and crossbones. The labels on highly toxic chemicals also tell of the dangers and list the antidote. You should also have a list of the poison centers in your area. There is a list of these in the packet you will be given later.

47. equipment	To prevent exposure to these dangerous chemicals, you should wear goggles and gloves, and have a respirator with the proper filter available. A list of recommended filters is also in your packet of material.
48. man in equipment	Maximum protection is offered by a respirator, unlined rubber gloves, rubber boots, eye protection and body cover. But wait - where's your hat and rubber boots?
49. symptoms	Accidents will happen, however, and you should be aware of the general symptoms associated with pesticide poisoning: headache, giddiness, nausea, blurred vision or chest pains.
50. advanced signs	Advanced signs of poisoning are excessive sweating, pinpoint pupils, drooling and vomiting. See your doctor immediately if there is any doubt.
51. booklets	In your packet is a booklet on the certification of pesticide applicators. The new pesticide application law is also enclosed in your packet, and you will note there are several requirements that must be met before you will be issued a commercial or private applicator's license. Review and become familiar with the new program, so you will be able to relay the appropriate material to students and farmers in your area. A portion of this exam will include drain and rinse, as well as safety procedures. Also acquaint yourself with the several other bulletins included in your packet.
52. (black slide - no picture)	

Iowa Poison Information Centers

1. Blank Memorial Hospital, 1200 Pleasant Street, Des Moines, Iowa 50308
Mark Thoman, M.D., F.A.A.P., F.A.A.T., Executive Secretary - Phone 224-4229

2. State University of Iowa Hospitals, Iowa City, Iowa 52240
Robert Dick, R. Ph. General phone: 319-356-1616 - ask for poison information center

3. Trinity Regional Hospital, Fort Dodge, Iowa 50501
Director: Charles Dagle, M.; Robert E. Bellinger, R. Ph.
Phone: 515-573-3101 - ask for poison information center.

Poison Treatment Centers

City	County	Hospital	Administrator & Phone #
Ames	Story	Mary Greeley Memorial	John D. Worley, Jr. 515-239-2011
Atlantic	Cass	Cass County Memorial	Marlin J. Stirn 712-243-3250
Boone	Boone	Boone County Hospital	Charles R. Linden 515-432-3140
Bloomfield	Davis	Davis County Hospital	Charles H. Walker 515-664-2145
Burlington	Des Moines	Burlington Memorial	Glen H. Heagle 319-753-3011
Cedar Rapids	Linn	St. Luke's Hospital	Louis B. Blair 319-398-7211
Cedar Rapids	Linn	Mercy Hospital	Sister Mary Lawrence 319-398-6011
Clarinda	Page	Clarinda Municipal	Ed Butler 712-542-2176
Corydon	Wayne	Wayne County Hospital	Richard Gibson 515-872-2260
Council Bluffs	Pottawattamie	Jennie Edmundson	Edward R. Lynn 712-322-0231
Cresco	Howard	St. Joseph Mercy Hosp.	Sister Mary Jane deChantal 319-547-2101

Poison Treatment Centers (Cont'd)

City	County	Hospital	Administrator & Phone #
Creston	Union	Greater Com. Hospital	Delmer V. Richardson 515-782-7091
Davenport	Scott	Dav. Osteopathic Hosp.	Dwight G. Reigert 319-391-2020
Dubuque	Dubuque	St. Joseph Mercy Medical Center	Frank Richardson 319-588-8400
Eldora	Hardin	Eldora Community	Phillip Neofotist 515-858-5416
Emmetsburg	Palo Alto	Palo Alto Co. Hospital	Robert C. Garrison 712-852-2434
Harlan	Shelby	Myrtue Mem. Hospital	Cletus J. Turnbach 712-755-5161
Independence	Buchanan	Peoples Memorial	Tom R. McNeal 319-334-2511
Iowa Falls	Hardin	Ellsworth Municipal	Donald Wilson 515-648-4631
Jefferson	Greene	Greene Co. Med. Center	James E. Bagley 515-386-2114
Keokuk	Lee	St. Joseph's Hospital	Frederick Shrimpton 319-524-2710
Keokuk	Lee	Graham Hospital	Greg Miller 319-524-1240
Marshalltown	Marshall	Marshalltown Area Com. Hospital East	Omar Voran 515-752-4511
Mason City	Cerro Gordo	St. Joseph Mercy Hospital	Sister Mary Corita Heid 515-424-7213
Muscatine	Muscatine	Muscatine General Hosp.	J. W. Meyers 319-263-4311
Newton	Jasper	Skiff Memorial Hosp.	Marc Ihm 515-792-1273
Oelwein	Fayette	Mercy Hospital	Sam Ruma 319-283-2314
Onawa	Monona	Burgess Memorial Hospital	Dean A. Vaughn 712-423-2311

Poison Treatment Centers (Cont'd)

City	County	Hospital	Administrator & Phone #
Orange City	Sioux	Orange City Mun. Hosp.	Mrs. Helen VanGelder 712-737-4984
Ottumwa	Wapello	Ottumwa Hospital	Richard G. Schreiber 515-682-7511
Ottumwa	Wapello	St. Joseph Mercy Hosp.	Sister Mary S. Wickenkamp 515-684-4651
Pocahontas	Pocahontas	Pocahontas Com. Hosp.	Orren Lee 712-335-3501
Sac City	Sac	Loring Hospital	Carl Steward 712-662-7105
Shenandoah	Page	Hand Community Hosp.	Fred Cline 712-246-1230
Sioux City	Woodbury	St. Luke's Med. Center	Robert F. Peck 712-279-3500
Sioux City	Woodbury	St. Vincent's Hospital	Richard Zunker 712-279-2010
Sioux City	Woodbury	St. Joseph Mercy Hosp.	Sister Mary Margaret 712-277-7000
Spirit Lake	Dickinson	Dickinson Co. Memorial	Floyd A. Kanne 712-336-1230
Storm Lake	Buena Vista	Buena Vista County Hosp.	Harris W. Feldick 712-732-4030
Vinton	Benton	Virginia Gay Hospital	George G. Garwood 339-472-2348
Waterloo	Black Hawk	Allen Memorial Hosp.	James T. Walter 319-235-3941

References: Clinical Toxiology of Commercial Products by Gleason, Gosselin, Hodge and Smith, Baltimore, Maryland.

For Supplementary Bulletins write to the Department of Pharmacology, University of Rochester School of Medicine and Dentistry, Rochester, New York.

How Does a Local Group Organize a Pesticide Container Disposal Project?

This program is designed for the disposal of five gallon metal containers and must be a local group project.

(Suggested Procedure Only)

YOU SHOULD - - -

I. Educate your membership.

  A. Make presentation to group using some of the materials in this packet.

  B. Be sure to include the "Drain and Rinse" decontamination procedure.

  C. Familiarize the group with proper farm storage technique.

  D. Familiarize the group with pesticide applicators certification requirements.

II. Involve a local chemical or fertilizer dealer to help sponsor the project.

  A. They may have a can crusher and be willing to loan it to your group.

  B. They can act as a local collection point.

  C. They may be able to supply a mailing list for publicity or may include information in their newsletter.

  D. They can help obtain a market for your crushed cans.

III. Work with your local Community Betterment Committee, or several groups may work with County or Board of Supervisors (Road and Ditch Clean Up).

  A. They may provide co-sponsorship.

  B. Distribute a list of poison centers and other information to interested people.

IV. Disposal of crushed cans.

  A. Locate a scrap metal dealer willing to buy the crushed cans.

    1. Find out how the cans must be prepared before delivery.

    2. Get in touch with State DEQ if any questions.

B. If there is no market for the cans...

1. The project is still needed since the cans still require disposal.

    a. This is a valuable service for Area Agriculture.

    b. You may consider making a small charge, for example (five cents per can), to cover your costs.

2. Contact your local landfill manager.

    a. Discuss the project with him.

    b. Request delivery and disposal instructions from him.

3. If neither the scrap metal dealer nor landfill manager will accept the containers you can...

    a. Educate people how to get rid of containers themselves.

        (1) Bury properly --- away from wildlife and livestock, and in an area where no water contamination can occur.

    b. Be sure to educate user of pesticide how to properly drain and rinse no matter what disposal method is used.

C. Keep a record of participants and give credit to those who contribute to the project.

1. Local newspaper might recognize them by listing citizens who used proper disposal procedures.

2. Include local citizens who donate time, space, equipment, money, etc.

V. Publicize the program.

A. Use local newspaper.

B. Make up posters for distribution to chemical dealers and other ag-related business.

- C. Use local radio and/or T.V. stations.
    - 1. Group should be featured in public service announcement.
        - a. Show how to "Drain and Rinse".
        - b. Announce place of collection and collection date that the public can deliver.
            - (1) Group might wish to collect or make arrangements for co-sponsors to pick up drained and rinsed containers.
- D. Develop a local slogan such as "Be a Kan Krusher".
- E. Offer prizes for achievement.

VI. Collecting and Crushing.

- A. Point of collection must be established.
- B. Do not handle "Non-drained and Non-rinsed" cans; they still contain poison.
- C. Obtain a can crusher.
- D. Do not rinse cans at crushing site.
- E. Locate storage facilities for crushed and non-crushed cans.
- F. Decontaminate any vehicles (pickup or truck) with a large amount of water. Do not allow rinse water to contaminate well or stream.
- G. Notify local health personnel before beginning the project so they can have treatment available in case of accident.
- H. Realize this is not a "Risk-free" project, and that legal liability could fall on the group if an accident occurs where proper safety precautions were not exercised.

How Does a Local Group Organize a Pesticide Container Disposal Project? (Cont'd)

VII. Information on other types of recycling projects may be obtained from:

Mr. Gene Evans, Environmental Specialist
Surveillance & Compliance Section
Land Quality Management Division
Iowa Department of Environmental Quality
P.O. Box 3326
3920 Delaware Ave.
Des Moines, IA 50316

Telephone: 515/281-4203

Conclusions and Recommendations

A follow-up of the Pesticide Container Disposal seminars was accomplished at a Department of Public Instruction sponsored Vocational Agriculture workshop in Des Moines, Iowa, in July 1976. Two hundred forty-three schools were invited to attend and 115 forms were voluntarily completed. A copy of the summary of the survey will be found in the next section.

Pesticide Container Disposal
Evaluation & Survey Form

Your frank evaluation of our seminars will assist with future planning and help us make revisions and improvements in the program. Please complete this form and hand it to the person at the door as you leave this meeting.

Where did you attend the Pesticide Container Seminar? ____________________

Check the responses that reflect your thinking:

	Too Long	About Right	Too Short
Length of seminar was:	34	78	3
Discussion time was:	15	84	19
Lecture time was:	39	76	2

	Excellent	Good	Fair	Poor
Instructor's qualification appeared: . .	31	65	17	6
Explanations were:	13	61	36	5
Use of film, handout material, etc. was:	28	59	26	3

	Yes	No	Uncertain
Did this seminar hold your interest?	79	17	16
Did this seminar help you in your job?	70	15	27

1. How many educational meetings did you sponsor? 63 Attendance? 1,527

2. How many times did you use the slide presentation? 182

3. Did your F.F.A. Chapter sponsor a Drain, Rinse and Crush Program?
Yes 11 No 98

4. Did you sponsor a container collection program? Yes 11 No 98

5. How many pounds did you collect? 11 schools reported a total of 97,760 pounds.

6. How did you dispose of the crushed containers?
Sold 10 Haul to Landfill 3 Buried elsewhere 2

7. Do you plan to conduct a program this 76-77 school year?
Yes 43 No 60

If no, list reason(s): (Comments submitted on the 115 individual survey forms are summarized for brevity.)

Reasons given include risk relating to profit, outlets, liablity, restrictions and safety because some containers are not properly rinsed. Other reasons included comments indicating many landfills and salvage yards will not accept the cans.

Pesticide Container Disposal
Evaluation & Survey Form (Cont'd)

8. Please list any improvement you would recommend: (Your comments)

Suggestions included an improvement for design of a can crusher, information regarding a possible can crusher purchase, disposal locations and collection stations to be set up by dealers.

Other comments also related to problems including disposal of rinse water, finding a close disposal site, loss of student interest when school is over and a recommendation for disposal of old rusty containers which have not been rinsed.

It is interesting to note the number of constructive suggestions relating to program improvement are few in comparison to those relating to concerns for safe handling of pesticide cans. Safe handling of cans by students is based on the premise that the farmer will properly triple rinse each can but the survey indicates this premise is not presently reliable.

Recommendations:

1. Iowa's vocational agriculture teachers should be surveyed again. The follow-up survey conducted in July 1976 was too soon after the six seminars. A follow-up survey at this time would give much more information regarding success, failures, problems and suggestions for improving secondary student participation in a can recycling program.

2. All metal containers should be registered and include a deposit by the dealer to assure their return. In addition, prior to returning cans, the applicator should be required to triple rinse all cans and have a hole punched in the bottom of each can to assure proper rinsing and prohibit reuse. We feel the dealer has a significant responsibility in any successful recycling program.

3. All applicators should be licensed and required education should be included as a part of the licensure procedure.

PART II

HAZARDOUS SUBSTANCES - PAINTS AND SOLVENTS

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RECOGNITION AND USE OF PAINTS AND SOLVENTS
HAZARDOUS SUBSTANCES

MODULE I

Prepared for

Iowa Department of Public Instruction
Office of Planning and Programming
Iowa Department of Agriculture
Job Service of Iowa*
U.S. Environmental Protection Agency
Iowa Department of Environmental Quality

By

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Community Education Division
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*formerly Iowa Employment Security Commission

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PREFACE
(To the Instructor)

The following two teaching modules were written to provide the instructor with maximum flexibility in presentation. The anticipated audience is line supervisors (foremen) but there is the option of higher management (safety) personnel or simplifying it for use with operators should need arise.

It is necessary for the facilitator to be thoroughly familiar with the subject matter. He should make every effort to familiarize himself with the work place of his audience and substances in use. To this end it is strongly recommended that slides (photographs) of a variety of work situations be procured and shown at the beginning of each module without comment and at the end of each module with learner discussion.

This work was guided by the Code of Federal Regulations and NFPA Regulations on hazardous substances but direct references to these works should be scrupulously avoided with the learner. The same policy should also be observed regarding references to "Safety". The rationale for this is the two topics, as such, will "turn off" many people whereas consciousness of safety and recollection of regulations should be a natural outgrowth of a thorough presentation.

The instructor is encouraged to make use of current pertinent newspaper or magazine articles as supplemental handout materials to emphasize the usefulness of information given in these modules.

An instructor's narrative accompanies each module. It is provided to assist the instructor with module and submodule introductions, and guide the use of visual aids, discussion and group activities.

HAZARDOUS SUBSTANCES - PAINTS AND SOLVENTS

Background Information

The use of paints and solvents is commonplace in industry. Workers handling these substances daily encounter situations which carry hazard potential and they should possess the knowledge necessary to protect themselves and others from harm.

In order to secure the necessary guidance in developing training programs to impart substance information to workers, an advisory committee drawing membership from management of affected industries was formed. The experience of this group guided specific topic selection and assisted in narrowing the scope of the modules to manageable training units. They served to provide an overlay of industrial practicality for the subject's academic foundation. Their advice, in summary, was:

1. The use of paints and solvents is commonplace in industry. Workers handling these substances daily encounter situations which carry hazard potential and they should possess the knowledge necessary to protect themselves and others from harm.

2. Industries would be reluctant to release supervisory personnel for full days to receive instruction. It was agreed that the most acceptable type instruction would be tailored to several on-site, short duration sessions to be conducted during or immediately following normal working hours.

3. If instruction of small companies' employees were desired, it would be necessary to establish a class composed of several different employee groups at a central location.

4. Course material which is taught with frequent reference to government regulations is not effective due to learner resistance.

To this end, two training modules on paints and solvents were subsequently developed to assist industry in teaching workers and supervisors fundamental characteristics of organic solvents and compounds. These modules were produced in submodular form to facilitate separate presentations not exceeding two hours in duration. This knowledge, in the hands of those who handle the product, should serve to increase individual concern for the preservation of the work place and workers' health and safety.

Module I, Recognition and Use of Paints and Solvents, addresses the physical and chemical properties of the substances. The information conveyed in the Material Safety Data Sheet is used as a basic teaching tool. Potential for fire and spills is stressed as well as prevention and emergency procedures to be taken, should they occur.

Module II, Health Consideration in the Use of Paints and Solvents, incorporates the physiological effects of these substances with first aid and rescue techniques. Use of personal protective equipment to avoid short or long-range damage is emphasized.

Because the Material Safety Data Sheet is the vehicle for transmitting information, the two modules are easily adapted to any industrial situation in which paints and solvents are used. All that is required to adapt the module to a specific situation is substitution of the data sheets for the particular products being used.

Curriculum Development and Instruction

The two modules were pilot tested in-plant with a group of foremen supervising painting and degreasing operations between February 17, 1977, and March 10, 1977. Each of the submodules was presented as a separate two-hour session. A pretest and post-test were administered with each module.

Following this initial presentation, the training modules have been revised and appear in this volume in finished form.

SUMMARY

Hazardous Substance Training Module I
Recognition and Use of Paints and Solvents

Between February 14, 1977, and February 24, 1977, Module I - Recognition and Use of Paints and Solvents - was tested with a pilot group of sixteen employees of a cooperating plant. Each of four submodules was presented in a separate two-hour session.

A pretest was administered at the beginning of Submodule 1 and a post-test was administered at the conclusion of Submodule 4.

Pilot Learners were all foremen involved in work areas utilizing paints, solvents and related products in applications including spray paint booths, electrostatic spray painting, touch-up hand spray painting and degreasing. These people came to the first session involuntarily at the request of their general foremen and with considerable skepticism. There was, in the course of four class meetings, a marked change of attitude and interest. The contributions to discussion were indicative of learner involvement.

Pretest results (25 matching definitions with terms) were very low. Tabulation of correct response frequency rendered a mean score of 22.18%.

Submodule 1, Substance Labeling and Safety Data Sheet Vocabulary, was presented in the mode of lecture with slide and transparency visual supplement. Learners were generally attentive. However, the general atmosphere was one of endurance. This was not unanticipated due to the nature and quantity of material presented. Learner questions generally addressed clarification of definitions. This session may be evaluated as satisfactory, in retrospect, based on succeeding submodule interest and participation.

Submodule 2, Interpretation of the Material Safety Data Sheet, was presented in the mode of learner participation, data interpretation, discussion, conclusions and problem solving. The learners made many requests for redefinition of terms and how they corresponded to safe and recommended practices. A lack of interest in change was displayed during this session. However, subsequent sessions revealed a raised awareness level and questioning of plant practices on the part of the participants.

Submodule 3, Fire and Explosion, was presented in the mode of lecture, discussion, supportive films, handout charts and problem solving exercises. Learner response was enthusiastic; there were several contributions of work situations observed in the preceding week. Individuals brought up incidents recently reported in the news media for discussion. During the concluding discussion there was frequent correlation of information presented in the submodule to existing work situations and possible remedial measures which could be implemented by foremen. There were also a number of substance specific questions asked and requests for additional information to be brought to next session.

SUMMARY

Submodule 4, Spill and Leaks, was presented in the mode of lecture and discussion. Learners were particularly interested in reporting procedures and measures to be taken in event of large spills. It was evidenced in discussion that the foremen were placing emphasis on learning correct emergency responses. They were also intent on knowing what precise effects they might expect from substances in their work areas.

Post-test evaluation showed an average information gain of 38.8% from pretest in the area of recognition and use of paints and solvents.

Learner attitude changed from initial skepticism to enthusiasm and curiosity. During the last session the in-plant slides which had been used in Submodule 1 were reviewed. The response to the second showing was markedly different and pointed to the altered attitudes of the learners. There were many comments indicating that situations in the photographs had been corrected and that the learners were able to recognize hazards which had gone unnoticed in the original presentation. Based upon these observations and significant improvement of learner scores from pretest to post-test, it is possible to conclude:

1. Learners' awareness level was raised with regard to recognition of potentially hazardous situations in their work place.
2. Efforts were being made to improve housekeeping practices.
3. Information on paints and solvents is now being more actively sought and used.
4. Learner ability to interpret available information was increased.

HAZARDOUS SUBSTANCES

MODULE I: RECOGNITION AND USE OF PAINTS AND SOLVENTS

MODULE II: HEALTH CONSIDERATIONS IN THE USE OF PAINTS AND SOLVENTS

Auxiliary Teaching Materials

A. Instructional Module Packages (Course outlines and instructor's narratives.)

B. Material for class reference:

1. National Safety Council Data Sheets for substances being studied.
2. Manufacturing Chemists' Association Material Safety Data Sheets for substances being studied.
3. National Fire Protection Association Fire Protection Guide on Hazardous Materials.
4. Overhead transparencies and slide sets.
5. Films.
6. NIOSH Health and Safety Guide for Manufacturers of Paints and Allied Products, June 1975.
7. Examples of personal protective equipment in use.
8. First aid models.

C. Material for distribution:

1. NFPA Diamond Warning Placard Reference Chart.
2. NIOSH Fire Extinguisher Chart.
3. Flammability Classification Chart.
4. Material Safety Data Sheets for products being studied.

Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 1

Substance Labeling and Safety Data Sheet Vocabulary

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Hazardous Substances

Recognition and Use of Paints and Solvents

Module I in Four Submodules

Introduction

This module is to be presented in four submodules addressing:

1. Substance Labeling and Safety Data Sheet Vocabulary
2. Interpretation of the Safety Data Sheet
3. Fire and Explosion
4. Spills and Leaks

Module design has been guided by the premise that an employee who possesses fundamental understanding of substances encountered in the course of daily work will be a company asset. The informed employee will be more alert to appropriate applications, storage and handling techniques which will reflect directly on cost savings, both in man-hours and materials. In addition, this employee is better able to understand the significance of accurate reporting and proper procedures which can be invaluable in emergency situations.

Presentation methods combine lecture-discussion supplemented by visual aids and handout materials. Controlled demonstrations and information interpretation sessions will also be included in the format.

The learner will be directed through course material in a positive, how-to manner. Cost reduction, increased job efficiency and expanded individual observation capabilities will be stressed.

Educational materials distributed to the learner make no reference to regulatory legislation or employer-supplier liability. The materials used will convey concrete information regarding substance identification, characteristics and handling.

Safety is not addressed directly as a formal topic. The rationale being the body of information transmitted combined with directed learner activities, in and out of the classroom, should raise the awareness level of the individual sufficiently to increase safety consciousness and improve safety procedure adherence.

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Module Objectives

The learner shall be able to:

1. Understand substance label information significant to its efficient and safe handling and use.
2. Understand the vocabulary of Manufacturers' Material Safety Data Sheets.
3. Use information conveyed in Material Safety Data Sheets specific to efficient and safe handling, storage, use and disposal.
4. Identify general fire classifications, approved fire extinguishers to be used and methods of fire extinguisher operation.
5. Identify the information requisite for safe and effective fire control.
6. Identify proper remedial procedures for spills and leaks.
7. Understand the basic concept of substance decomposition and its potential effects on job efficiency and the work environment.
8. Recognize potentially hazardous situations and the importance of accurate reporting.

Submodule 1

Objectives

Upon completion of Submodule 1, the learner should be able to:

1. Understand substance property information conveyed in DOT labels.
2. Understand hazard information conveyed or implied in DOT labels.
3. Understand categorization of data used in Material Safety Data Sheets.
4. Understand meaning of topic headings used in Material Safety Data Sheets.

Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 1

Substance Labeling and Safety Data Sheet Vocabulary

Outline

I. Hazardous properties of paints and solvents are identified for carriers and users.

   A. Labels designate special substance classifications.

      1. Flammable Liquid is a liquid having a flash point below 140° F.

         a. Flammable liquids are divided into two classifications, I and II.

         b. Hazard potential increases as flash point decreases.

      2. Combustible Liquid is a liquid having a flash point at or above 140° F.

         a. Combustible liquids have one classification, III.

         b. Combustible liquids may not be classified as such if flash point exceeds 200° F.

         C. Hazard potential increases as flash point decreases.

      3. Corrosive refers to material which causes destruction of human tissue or reacts readily with steel or aluminum.

         a. Container material becomes a factor to consider.

         b. Contact with human tissue should be avoided.

      4. Oxidizing or Oxidizer refers to material which will release oxygen readily.

         a. A material of this classification may not burn.

         b. Hazard potential presented is, with exposure to heat, the material may release oxygen and support combustion.

      5. Poison or Toxic applies to a substance having the capacity to produce personal injury or illness to man through ingestion, inhalation or absorption through body surfaces.

B. Placards convey basic hazard warning information.

  1. Placard information serves to alert handlers and general public to possible hazards.

    a. Words associated with placarding are "WARNING", "DANGER", "CAUTION", "NO SMOKING", "KEEP AWAY", etc.

    b. Placards may or may not give additional information.

    c. When placard explanation concerning hazard is not included it is implied.

  2. Placard information serves to guide emergency response personnel in procedure selection.

    a. Fire control procedure selection depends upon proper substance identification.

    b. Substance placarding will direct proper selection of protective equipment.

C. N.F.P.A. Hazard Identification System provides rapid substance reference for fire departments, emergency control personnel and plant safety personnel.

  1. Basic placard design is a diamond subdivided into four quadrants.

  2. Quadrants are reserved for specific information.

    a. Left quadrant denotes health information.

    b. Top quadrant denotes flammability information.

    c. Right quadrant denotes reactivity information.

    d. Bottom quadrant is reserved for information regarding radiation, reactivity with water and/or oxidizing properties.

  3. Spatial arrangement is supplemented by color coding.

    a. Blue indicates health.

    b. Red indicates fire.

    c. Yellow indicates reactivity.

    d. Bottom quadrant is white or colorless.

4. Numbers in each of the first three quadrants indicate potential hazards in diminishing degrees from "4" through "0".

5. Special symbols in bottom quadrant are used to indicate avoidance of water and/or oxidizing properties of the substance.

   a. ~~W~~ indicates water may constitute a hazard in fire fighting.

   b. OXY indicates substance is an oxidizer.

II. Material Safety Data Sheet use requires a basic vocabulary mastery.

   A. Data Sheet headings designate specific information blocks.

      1. Substance identification is the first function of a Material Safety Data Sheet.

         a. Chemical Name and Synonyms isolate a substance from all others.

            i. Chemical names have technical integrity.

            ii. Chemical names indicate actual composition.

            iii. Chemical grade indicates degree of purity.

         b. Trade Name is a name assigned to a substance by a manufacturer or distributor.

            i. Trade names may not have technical significance.

            ii. Trade names may indicate a generally accepted substance use.

         c. Chemical Family assigns a substance to its chemical group.

            i. Chemical family members may share some physical properties.

            ii. Chemical family members may share some common reactivity properties.

         d. Formula of a substance defines its exact chemical structure.

            i. Formulae are fundamental to communication among chemists.

            ii. Formulae describe the method of substance assembly - blueprints, if you will.

B. Physical Data section provides information regarding observable substance characteristics.

1. Boiling Point is the temperature a liquid must reach for spontaneous formation of vapor bubbles.

    a. Boiling point varies directly with atmospheric pressure.

    b. Liquid temperature will not exceed boiling point unless atmospheric pressure is increased.

2. Specific Gravity (water = 1) denotes the weight of a substance relative to water.

    a. A substance with a specific gravity less than 1 will float.

    b. A substance with a specific gravity greater than 1 will sink.

    c. Specific gravity of a substance has a direct bearing on fire control.

3. Vapor Pressure (mm of Hg at 0° C) of a liquid substance indicates the force its molecules exert to escape (vaporize) into the immediate atmosphere.

    a. In solids this is called "sublimation".

    b. The higher the vapor pressure of a substance, the more rapidly it will evaporate.

    c. Water has a vapor pressure of about 17.5 mm of Hg. at 20° C.

    d. Ether vapor pressure at 20° C is 442 mm of Hg.

    e. Vapor pressure varies with temperature.

    f. Vapor pressures of solutions vary with properties of solvent and solute.

4. Evaporation Rate (Ether = 1) is closely related to vapor pressure.

    a. Evaporation rating of a substance refers to drying time in seconds from a measured spill on exposure to air.

    b. Most substances display an evaporation rate number significantly higher than ether.

    c. Lower evaporation rate numbers indicate very rapid liquid volume loss during air exposure.

Submodule 1 (Cont'd)

5. Solubility in water refers to the amount of a substance which will readily remain mixed (dissolved) in water.

   a. When a substance remains suspended in water, water is referred to as its solvent.

   b. Rising temperatures usually will increase the solubility of a substance.

   c. A liquid soluble in a liquid is said to be miscible.

6. Appearance describes the color and state of a substance.

   a. Substance may be solid, liquid or gaseous.

   b. Substance may be clear, cloudy or opaque.

   c. Substance may exhibit any degree of coloration.

7. Pounds/Gallon indicates the weight in pounds of a substance volume measure of one gallon.

   a. A gallon of lead weighs more than a gallon of water.

   b. Significance is similar to that of specific gravity.

   c. Water weighs about 8.3 pounds per gallon at standard temperature and pressure.

8. Vapor Density (air = 1) compares a volume of a vapor to an equal volume of air at a given temperature.

   a. A vapor density greater than 1 indicates a substance will collect at and flow toward lowest possible point.

   b. A vapor density less than 1 indicates a substance will rise to the highest point possible in air and dispurse.

9. Solubility in Acid indicates to what percent by volume a substance will dissolve in an acid solvent.

10. Per Cent Volatile by Volume indicates how much of a substance will vaporize (evaporate).

    a. If a substance is less than 100% volatile there will be a residue at the end of total liquid evaporation.

    b. If a substance is 100% volatile there will be no residue at the end of the liquid evaporation process.

11. Odor is a description of the qualities perceived by the human smelling sensory organs (olfaction).
    a. Many adjectives are used to describe odor including sharp, pungent, acrid, acid, etc.
    b. A usual descriptive process for odor is one of comparison, "like mint", "like moth balls", "like engine oil", etc.
    c. Frequency of exposure reduces individual sensitivity.

C. Hazardous Ingredients Data section provides information regarding specific hazardous substance quantity by percent of volume in a product.

1. This information has significance in determination of a mixture's vapor properties.
2. This information has significance in determination of a mixture's residue properties.

D. Fire and Explosion Data section provides information necessary for correct emergency control techniques.

1. Flammable Limits in Air designates the concentration ranges of vapor in air which are flammable when an ignition source is present.
    a. Lower Flammable Limit (LFL) is least vapor volume by percent concentration presenting a flammability hazard.
    b. Upper Flammable Limit (UFL) is greatest vapor volume concentration by percent concentration presenting a flammability hazard.
    c. Use of LEL and UEL refers to lower and upper explosion levels.
2. Flash Point of a liquid is the lowest temperature at which sufficient vapor is given off to form an ignitible mixture with air near its surface or within the vessel used.
    a. This generally applies to liquids.
    b. Vaporization of a solid at normal ambient temperatures is called sublimation.
3. Flammability (combustibility) Classification of liquids assigns number-letter class codes to flash points and boiling points on a graduated scale.

   a. Class I flammable liquids include those having flash points below 100° F.

      i. Class IA includes flash points below 73° F. and boiling points below 100° F.

      ii. Class IB includes flash points below 73° F and boiling points above 100° F.

      iii. Class IC includes flash points at or above 73° F and below 100° F.

   b. Class II flammable liquids include those having flash points at or above 100° F. and below 140° F.

   c. All liquids having flash points at or above 140° F are classified as combustible.

4. Extinguishing Media directs emergency response personnel in selection of proper fire control methods.

5. Special Fire Fighting Procedures notes specific precautions for emergency personnel.

   a. Fire extinguishing media to avoid are specified.

   b. Special protective equipment for personnel is described.

6. Unusual Fire and Explosion Hazards describes conditions not noted elsewhere occurring in storage, handling and use which may increase fire or explosion risk.

E. Spill or Leak Procedures section notes mode of cleanup in event of a spill or leak of a hazardous substance.

   1. Steps to be taken if material is released or spilled describes conditions to avoid during cleanup and method of containment.

   2. Waste disposal method describes correct treatment of waste materials resulting from cleanup.

F. Reactivity Data section notes special chemical activity of designated hazardous substance.

   1. Stability addresses the general tendency of a substance to change or remain the same under normal storage conditions or use.

   2. Incompatibility notes any materials which should be kept out of contact with hazardous substance described.

Submodule 1 (Cont'd)

3. Hazardous Decomposition Products describes new hazardous substances which may be produced from chemical or thermal decomposition.

G. Special Precaution section provides specific information related to labeling and handling.

1. Precautionary Labeling supplies information pertaining to use, content, decomposition products, health, hygiene and first aid procedures.

2. Other Handling and Storage Precautions and Conditions describe heat and fabrication procedures to be avoided and protective equipment requirements.

Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 1

Substance Labeling and Safety Data Sheet Vocabulary

Instructor's Narrative

(Correlated for use with Outline.)

Opening remarks: The industrial use of paints, and solvents involves the use of a variety of materials. Many of these materials are either health hazards or fire or explosion hazards. Some are both health and fire or explosion hazards. The best protection a worker can have is knowledge of the hazards of the materials he will handle.

Solvents, alone or in paints, are probably the most widely used chemical group. They are found everywhere, from the sophisticated chemical laboratory to the home kitchen cupboard and garage. They are so common, so universally used, the dangers involved in their misuse are often forgotten or overlooked.

Paints contain solvents which carry their hazards with them. Paints also contain pigments, extenders and fillers. These substances have hazards of their own to add to the mixture. They sound innocent enough - lead, metallic chromates, cadmium, copper, cobalt, mercury, arsenic, silica, talc and mica to name a few. They are substances which, in varying amounts, the human body cannot tolerate.

The term solvent means any substance used to dissolve another. They may be broadly categorized as aqueous (water) or organic. Aqueous systems are used with alkalies, soaps, acids, detergents and many other water soluble materials. Organic solvents most commonly may be categorized as aliphatic, aromatic and halogenated hydrocarbons, alcohols, ketones, ethers and esters.

Aqueous systems carry some hazards. Prolonged skin exposure can cause skin irritation, breathing vapors excessively can cause throat irritation and bronchitis, and ingestion can be very serious, even fatal. We cannot dismiss their hazards, but they are somewhat minimized and made more controllable because they do not vaporize easily.

Organic solvents vaporize more readily and present a very different problem. They should all be considered toxic, flammable or capable of producing hazardous decomposition products to a lesser or greater extent.

How does one understand the destructive properties of these organic solvents and paints? It isn't so difficult if you know a little of the vocabulary. A person who has just acquired his first citizens band car radio has to learn the lingo before he can communicate - send and receive messages with understanding. That is what we are about to do, learn the lingo of solvents and paints. It can save lives. What can be more important than words that save lives?

(In-plant photographs of label use are incorporated into part I. A. Alternative transparencies are provided.)

I. A. There is an increasing emphasis in product labeling. Labels used to identify bulk quantities in shipping and storage are usually brief - one or two words, a simple picture.

1. Slide Set (R1SS-1): In-plant labels if available.
   Transparency (R1T-1): DOT label. Red, black and white.
   Flammability will be defined and stressed throughout four submodules. Refer to student guide.

2. R1SS-2: In-plant labels.
   R1T-2: DOT label. Red, black and white.
   Stress diminished but real hazard.

3. R1SS-3: In-plant labels.
   R1T-3: DOT label. Black and white
   learner response.

4. R1SS-4: In-plant labels.
   R1T-4: DOT label.

5. R1SS-5: In-plant labels.
   R1T-5: DOT label. Black and yellow.
   Touch on degrees of poison. Stress modes of assimilation.

(Slides of in-plant situations are not a necessity from this point on.)

B. 1. R1T-6: Collage of one word warnings. Discuss implications. "Danger" means DANGER! "Corrosive" means it will DESTROY metal, skin, eyes, etc.!

2. R1T-7, 8, 9: Placards from Manufacturing Chemists Association and National Safety Council. Take the time to assess implications.

C. 1. R1T-10: Blank diamond, NFPA Hazard Warning Chart may be handed out.

2. R1T-11: Diamond with quadrant hazards identified.

3. R1T-12: Quadrants identified with color and hazard. Explain numbers in respective colors may be used without diamond outlining them.

4. R1T-13: Four complete placards for degree of hazard discussion.

5. R1T-14: Four complete placards. Discuss related hazards.

II. In addition to labels and placards provided to inform us, there is another information vehicle available from substance manufacturers and suppliers. This instrument is called the Material Safety Data Sheet. The value of this cannot be overemphasized. In order to use it to its fullest value a certain amount of vocabulary understanding is necessary. One need not be a formulation chemist to make use of information contained in this document.

A. 1. R1T-15a: Blank Safety Data Sheet, Students may be handed blank Safety Data Sheets and encouraged to take notes on them.
R1T-15b: Reverse side of T-15a.

a. R1T-15c: Chemical names of substances representative of organic solvents common to industry.

b. R1T-16: Trade names used by manufacturers or distributors showing incorporation of logs into product name. Compare with chemical names for real information potential.

c. R1T-17: Pictorial illustration of Benzene, Toluene and Xylene. Explain family commonalities as they occur in such areas as halogens.

d. R1T-18a: Pictorial view of formulae and building block analogies.

R1T-18b: Pictorial on scientific mode of communication.

R1T-19: Combination of T-18a and T-18b. Discuss and use block or tinker toy demonstration if desired.

B. 1. R1T-20a: Pictorial of boiling liquid. Use examples like water steam and transfer to boiling a corrosive or toxic substance. Pressure cooker and high altitude cooking are good examples.

2. R1T-20b: Pictorial of layered liquids. Use demonstration of dyed liquids or common substances such as vinegar and oil.

3. R1T-21: Comparative pictorial of acetone, mercury and water.

4. R1T-21: Repeat. Demonstrate a timed drying test comparing two or three solvents on a sheet of glass or concrete slab.

5. R1T-22: Pictorial of soluble and insoluble liquids. Demonstrate with water and oil, water and alcohol. Refer to item #2 in this section.

6. Beakers of water, motor oil, salt, milk, etc. may be used.

7. A balance demonstration may be used.

8. R1T-23: Pictorial of factory layout showing leak vapors' flow and pocket formulation. Use examples of gas leaks in basements and explosion potential.

9. A metal - acid reaction may be cited as example.

10. R1T-24: Pictorial comparison of paints, residues and percent volatile by volume. Use common household examples, bathroom glass, plant saucers and other freestanding evaporative conditions.

11. Stress desensitization on prolonged exposure.

C. Explain importance of section as it relates to paints. Mixture contents must be displayed for evaluation. Use some examples like "What's in Jello after it's made? Jello just isn't Jello, you know."

D. 1. R1T-25: Four part pictorial carrying vapor through flammable limits.

2. Demonstrate flash point. Reflect on D. 1.

3. R1T-26: Flammability classification breakdown. Discuss thoroughly.

4. Note there are several types of extinguishers and substance fire classifications. Not to be confused with flammability.

5. a. Discuss importance of correct media selection.

   b. Discuss need for P. P. E. in areas where fumes and vapors are a hazard. Thermal decomposition constitutes a hazard.

E. R12-27: Warning placard for Toluene. Discuss the section as a utility space for additional substance information.

Closing remarks: We have just examined the vocabulary required to understand hazard warnings, specific to paints and solvents. In the time between now and our next meeting be observant. Read those labels. Don't overlook household cleaners. You will be surprised at what you find.

Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 2

Interpretation of the Material Safety Data Sheet

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Submodule 2

Objectives

Upon completion of Submodule 2, the learner should be able to:

1. Use information conveyed in Material Safety Data Sheets to identify a substance.
2. Use information conveyed in Material Safety Data Sheet to predict physical properties of a substance.
3. Use information conveyed in Material Safety Data Sheet to predict fire and explosion properties of a substance.
4. Use information conveyed in Material Safety Data Sheet to predict reactivity properties of a substance.
5. Use information conveyed in a Material Safety Data Sheet to fundamentally assess problem situations.

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Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 2

Interpretation of the Material Safety Data Sheet

Outline

I. A substance may be examined critically using Material Safety Data Sheet information.

  A. The substance may be identified using several nomenclatures.

    1. Substance container may be labeled with a trade name.

    2. Substance container may be labeled with contents bearing a chemical name or synonyms.

    3. Substance container may bear its chemical formula.

    4. Substance container may bear the chemical family name.

  B. Physical Data information allows us to predict some substance behaviors.

    1. Boiling range indicates the temperature at which a liquid spontaneously produces vapor bubbles at standard pressure.

      a. Water boils at about 212° F (100° C) at normal atmospheric pressure.

      b. Substances with boiling temperatures approaching expected ambient temperatures represent a special hazard if vapors are flammable, reactive or toxic.

      c. Substances with boiling point far exceeding expected ambient temperatures should be evaluated by other criteria.

    2. Vapor pressure and evaporation rate indicate the force exerted by molecules in liquids (solids in some cases) to assume the gaseous state.

      a. High vapor pressures (high evaporation rate) in flammable, adversely reactive or toxic substances will increase hazard potential.

      b. Very low vapor pressures (low evaporation rate) usually restrict vapor concentration potentials to limits less apt to create hazards.

   c. In mixtures of two or more substances soluble in each other, the substance with the highest vapor pressure will evaporate in greatest quantity, changing the original material properties.

3. Substance solubility data indicates stable mixing properties.
   a. Range of substance solubility usually varies directly with temperature.
   b. Some startling exceptions to this rule include sodium chloride (salt) and calcium hydroxide (slaked lime) solubilities in water.
   c. Solubility dictates selection of effective modifiers.
   d. A mixture of liquids lacking solubility in one another will layer, left at rest.

4. Specific gravity and pounds per gallon give comparative weight information.
   a. Specific gravity, considered with solubilities, becomes a hazard judgment factor.
   b. Pounds per gallon provides information affecting shipping, storage, use and emergency procedures.

5. Volatility is an indication of residue expectations.
   a. Low volatility must be a consideration in waste disposal planning.
   b. Varying volatilities in mixtures must be considered.

6. Vapor density should be assessed in conjunction with evaporation rate and/or vapor pressure.
   a. High vapor density presents potential concentration hazards.
   b. Low vapor density indicates rapid dissipation.

7. Odor is a means of substance identification and detection.
   a. Many substances have distinctly characteristic odors.
   b. Presence of odor is an indicator of substance vapor concentration.
   c. Odor detection may not be considered as an accurate indicator of vapor concentration without other monitoring systems.

C. Hazardous data information is necessary for assessment of mixture properties.

  1. Percent by volume of a hazardous substance in a mixture may indicate degree and duration of potentially hazardous situations.

  2. Mixtures containing more than one hazardous substance may present a multiplicity of hazard considerations.

D. Knowledge of fire and explosion hazard data is a valuable guide in fire control and other emergency response.

  1. LFL, flash point and flammability classification should be considered in assessment of hazard potential.

  2. Extinguishing media, special fire fighting procedures and unusual hazards direct responding personnel in equipment selection and strategy.

E. Reactivity and special precautions should be evaluated simultaneously.

  1. Hazardous decomposition products directly affect handling and storage precautions.

  2. Incompatible substances and stability information may be reinforced in precautionary labeling instructions.

F. Spill or leak procedures direct personnel cleanup and recovery operations.

  1. Substance handling varies with quantity released in spill or leak.

  2. Special properties of substance are considered recommendations for disposal.

(This portion of outline is intended for an instructor's guide. Groups of three may be formed to expedite exercises. Instructor may alter order and presentation to suit needs of class.)

II. Individual evaluation exercises.

  A. Learners are to arrange all data sheets in handouts according to chemical family groups.

B. Select first family group for classification and evaluation.

  1. Evaluate family members' reactivity properties for similarities and hazard potential from greatest to least. Substantiate.

  2. Evaluate family members' physical properties for similarities and hazard potentials from greatest to least. Substantiate.

  3. Evaluate family members' fire and explosion properties for similarities and hazard potentials from greatest to least. Substantiate.

  4. Evaluate family members' recommended spill and leak procedures for similarities and hazard potentials from greatest to least. Substantiate.

C. Repeat process in II, B for each family group provided.

D. Critically compare families with regard to individual data sections.

  1. Progressively rate families regarding hazard potentials from fire and explosion.

  2. Compare variations between chemical families in spill and leak procedures.

  3. Compare reactivity data by chemical family.

(This portion of outline is intended for an instructor's guide. Groups of three may be formed to expedite exercises. Instructor is free to substitute other situations more or less challenging to class, as indicated.)

III. Information application to problem solving.

A. In an outside storage area vandals have rendered labels on ten barrels of assorted solvents illegible. It is known that this particular inventory consists of two barrels of toluene, one barrel of xylene, three barrels of mineral spirits and four barrels of methylene chloride. It is urgent that the barrels be relabeled correctly. Material Safety Data Sheets are available for reference.

  1. Assuming barrels are reasonably portable and cannot be opened, describe a method of separating the substances and identifying them correctly. Apply all information gained on substances, use safety equipment, etc.

2. If samples could be drawn off and containers were not portable, what method could be used to identify the substances correctly? Odor may not be used exclusively, use safety equipment.

B. Two solvents are mixed in equal parts by volume to fill a 20 gallon open vat.

Solvent	TLV	Vapor Pressure*	Pounds/gallon	Flash Pt.	Vapor Density
A	500	.7	7.46	106° F	4.6
**B	50	100	10.95	None Determined	4.85

*Substances remain completely mixed.
**B decomposes to form phosgene, hydrogen chloride and carbon monoxide.

C. Describe potential hazard properties of liquid and vapors when vat level is at:

1. 15 gallons.

2. 10 gallons.

3. 5 gallons.

D. How would you expect the evaporation rates of the two substances to compare?

Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 2

Interpretation of the Material Safety Data Sheet

Instructor's Narrative

(Correlated for use with Outline.)

Review: Ask for learner comments on product labels they have observed in the past week. During this discussion it would be helpful if the instructor used a few household items with content labels naming substances contained in safety data sheet handouts.

Opening remarks: Student handouts for Submodule 2 include an assortment of solvents and paint safety data sheets. Twelve solvents and three paints should suffice to represent the major solvent classifications and paint particular content.

The Submodule 2 outline is intended to be a guide to comparative discussion and information analysis. Time should be taken with each subpart of Section I to read information from several data sheets from different chemical family classifications. It may also be productive to show transparencies from Submodule 1 again in this presentation.

I. A. Note in some cases one or more names will be missing. The lack of family name and formula is common on paint safety data sheets.

B. 1. a. Recall the example of a pressure cooker and super heated liquids.

b. Discuss increased vaporization and hazard.

c. Refer to vapor pressure and evaporation rate.

2. Mention the significance of sublimation, use camphor as a prime example.

a. Discuss implications of readily vaporizing toxic and/or flammable substances.

b. Compare alcohol with vegetable oil or other examples.

c. Examine a safety data sheet for paint. Discuss significance in liquid property changes from beginning to end of evaporation process. Compare a paint and solvent.

3. Recall demonstration of solubility in Submodule 1.

a. Graphs of substance solubilities in water show most increase directly with temperature while some, like salt, remain constant, others, slaked lime as example, vary inversely.

b. Discuss precipitation and touch on supersaturated solutions, i.e., sugar water.

c. Solutions of unlike substances have diminished properties each so long as evaporation does not take place.

d. Recall Submodule 1 demonstration.

4. Discuss significance of S.G.'s and water solubility.

   a. Discuss the use of water in fire fighting low S.G. liquids.

   b. Plays role in identification of unlabeled substances.

5. Discuss evaporation of solvents and residues which may be expected. Evaporation sludges may be a consideration in disposal and warehouse planning.

6. Discuss downgrade flow of high vapor density substances, hazards of thermal decomposition and heating system air intakes and flowing to ignition source.

7. Discuss desensitization to odor and implications of odor detection not always being at same level. Value lies in detection of extremely high vapor concentrations alarm.

C. Information may direct investigation toward additional specific safety data sheets.

D. 1. If a substance has a Class IC flammability rating, LFL = 1.4 and high vapor pressure the hazard may be considered great. Compare substance specifics in data sheets.

   2. Compare directions on different data sheets.

E. Relates to both fire control and spill management. Make comparisons.

F. Must be given comparative discussion with reactivity and fire sections. Compare sections from different data sheets.

II. This section revolves around group participation. Instructor's role is to give directions, monitor time and see that discussions are constructively directed. Groups should be encouraged to write responses. Reconvene class for discussion. A flip chart may be used to record conclusions.

Submodule 2, Instructor's Narrative (Cont'd)

III. This section is self-explanatory. The learners, in small groups, will come to problem solutions. Class should be reconvened to discuss and record common observations.

Closing remarks: Ask class members to note fire management placarding and types of fire extinguishers they might encounter from now until next meeting.

Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 3

Fire and Explosion

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Submodule 3

Objectives

Upon completion of Submodule 3, the learner should be able to:

1. Recognize fire and explosion hazards most commonly associated with work situations.
2. Identify fire classifications.
3. Identify approved portable fire extinguisher types for specified substance fire classifications.
4. Identify correct modes of portable fire extinguisher application for specified extinguisher classification.
5. Identify information which would be of critical value to fire control management.

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Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 3

Fire and Explosion

Outline

I. Industrial paint and solvent fire hazard potential are present from storage through disposal.

  A. Storage facilities house hazardous materials in large quantities.

    1. Hazard potential increases directly with amount of material present.

    2. Closed containers constitute an explosion hazard when exposed to great heat.

  B. Substance transfer from storage to portable containers is hazardous.

    1. Spills or leaks may go undetected.

    2. Friction in container contact may provide ignition source.

  C. Potentially hazardous situations are present at job sites.

    1. Open containers, spray and waste accumulation contribute to high vapor concentrations.

    2. Mechanical and electrical equipment provide ignition source potentials from static electricity, hot surfaces, sparks and open flames.

    3. Plant personnel or visitors may fail to observe no smoking warnings.

  D. Waste accumulation and disposal procedures have built-in hazard potentials.

    1. Dry, particulated residues in sweepings, ducts and filters support rapid and/or spontaneous combustion.

    2. Cleanup rag depositories support spontaneous combustion.

    3. Layering of incompatible paints and varnishes can support spontaneous combustion.

    4. Cleanup crews may fail to observe same precautions exercised by application personnel.

II. Following precaution procedures minimizes fire hazard potential.

- A. Flammable substances not in use should be kept in properly designated storage areas.
    1. Incompatible substances should be stored in spatially separated areas.
    2. Storage areas should be policed for spills and leaks.
    3. Substances should be properly labeled and placarded.
    4. Storage areas should be clearly marked with hazard signs and entrance restrictions.
    5. Substances should be stored at job sites in limited quantities.
    6. Area should be protected from ignition source.
- B. Proper procedures should be observed in transferring flammable liquids from bulk to portable containers.
    1. Bulk containers should be interconnected and grounded.
    2. Portable containers should be bonded to bulk containers before transfer is initiated.
    3. Containers should be of approved fire-resistant containers equipped with flash screens and self-closing lids.
    4. All connections and piping systems should be leak and vapor free.
    5. Non-sparking tools should be used when opening or closing containers.
- C. Good housekeeping should be observed in work area.
    1. Containers should be kept securely closed when not in use.
    2. Spills and leaks should be cleaned up immediately.
    3. Combustible waste materials, such as oil, paint or solvent soaked rags, should be stored in metal containers (properly marked) and disposed of at end of each shift.
    4. Hazardous situations should be reported immediately to responsible supervisory personnel as soon as detection occurs.

III. Fires are classified according to substance.

  A. Fires involving wood, paper, cloth or other natural fibers are designated as Class A Fires.

  B. Fires involving flammable liquids, such as grease, oil, gasoline, solvents and paints, are designated as Class B Fires.

  C. Fires involving electrical equipment, such as motors, switches, etc. are designated as Class C Fires.

IV. Portable fire extinguishing equipment must be properly used.

  A. Fires must be classified in order to select proper extinguisher.

    1. Class A fires can be controlled by any extinguisher except ordinary dry chemical or carbon dioxide type extinguisher.

    2. Class B fires can be controlled by foam, carbon dioxide, multipurpose dry chemical and ordinary dry chemical extinguishers.

    3. Class C fires can be controlled by carbon dioxide and multipurpose or ordinary dry chemical extinguishers.

  B. Portable extinguishers must be properly directed at fire.

    1. Foam extinguisher stream should be directed above fire allowing foam to fall lightly on flames.

    2. Carbon dioxide extinguisher stream should be discharged as close to fire as possible, working from edge and gradually forward and upward.

    3. Soda-acid gas cartridge extinguisher stream should be directed at base of flame.

    4. Pump tank (foot activated) stream should be directed at base of flames.

    5. Dry chemical stream should be directed at base of flames.

      a. An additional coating of burning materials is necessary in Class A fires.

V. Fire emergency procedures should be known by employee for his work area.

  A. Flammable materials should be recognized by potential fire classification.

B. Fire extinguisher locations should be known.

C. Procedures for summoning emergency response personnel should be known.

D. Shutdown and alarm procedures should be known.

E. Regular and emergency exits should be known.

F. Proximities and quantities of other flammable or reactive substances should be known.

(This portion of outline is intended for an instructor's guide. Groups of three may be formed to expedite exercises. Instructor is free to substitute other situations more or less challenging to class, as indicated.)

VI. Response role play situations increase individual awareness.

A. You have just arrived for your shift. The building you work in is on fire and the fire department has arrived.

1. Describe to the fire chief:

a. Water supply locations.

b. Routes of ingress and egress (doors, walkways, stairs).

c. Location, type and quantity of flammable and/or reactive substances in or immediately proximate to the building.

B. A 500 gallon spill of a Class IA liquid has just occurred. It completely engulfed a 10,000 gal. tank footing marked 1-3-4-~~W~~ in NFPA diamond hazard placard. (Refer to NFPA Hazard classifications).

1. What would your first concern be?

2. What would you be able to tell emergency response personnel?

3. What would your step-by-step recommendations be to coping with the situation if you were in charge?

Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 3

Fire and Explosion

Instructor's Narrative

Opening remarks: Solvents and paints possess fire and explosion hazards to varying degrees. People should be wary of "Safety Solvents." A widely used term this can cause unsafe practices to develop. The specific fire related hazards of solvents fall into two categories. Solvents may be flammable and present fire fuel supply. Nonflammable solvents may decompose to release highly toxic substances. Paints present additional hazards attributable to pigment and filler content release of toxic fumes.

Student handouts for this submodule consist of safety checklists, charts identifying fire classifications by substance and portable extinguisher use instruction.

I. This portion of the outline for Submodule 3 is to serve as a discussion and information organization vehicle preparatory to reviewing a fire training film. Call upon individual learners to summarize their own work sites and procedures as the outline progresses.

   If facilities are available, the learners should have the opportunity to observe a temperature comparison demonstration. A comparison should be arranged between ambient temperature and internal temperature of a container of solvent saturated rags. This demonstration should be set up prior to class time and allowed to develop for at least one hour. Rags should have been prepared in advance.

   When all topics in Part I have been discussed through D.4, show film, "Closed Containers and Fires." This 20-minute film is produced by Iowa State University and has gained enthusiastic support among fire training personnel.

II. Following film in Part I the topics in Part II should be discussed. This overview of precautions may be summarized with a flip chart, if available, or on a chalkboard.

III. This portion of the submodule is to serve as a discussion and information organization vehicle preparatory to reviewing a film on portable fire extinguishers.

   A. Refer to student handout chart on portable fire extinguishers.

B. See A.

C. See A.

Ask learners to recount their own job site procedures and relate these to the outline.

There should be emphasis placed upon protection of drains. Drains should be considered off limits for disposal for two reasons. Flammables in drainage systems create an explosion hazard. Toxic substances present a contamination hazard.

IV. See III.

A. See III. A.

B. See III. A.

At conclusion of IV. B. show film, "Portable Extinguishers." This 20-minute film shows proper use of portable fire extinguishers. Types, classifications and use are covered. It is an excellent industrial training film.

V. This portion of the submodule is designed to be presented separately or eliminated, if need be. The film, "Flammable Liquid Fire Safety" should be shown at beginning of class session. This 20-minute film is designed to teach workers dangerous characteristics of flammable and explosive liquids and vapors. It gives basic instructions for fighting liquid fires. Particular attention is given to open-flame cutting and welding torches, static electricity and electrical equipment. Fixed fire extinguishing and automatic sprinkler systems are also described.

A through F. Discuss each topic briefly in light of material covered in Parts I through IV of Submodule 3. Relate material to learners' work situations when possible

VI. A. Use instructions in outline to set situation for students. Have students complete exercises on paper for A. Complete activity with group discussion and summary.

B. Repeat process in A.

Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 4

Spills and Leaks

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Submodule 4

Objectives

Upon completion of Submodule 4, the learner should be able to:

1. Recognize reporting responsibilities regarding spill and leak hazards.
2. Identify general remedial procedures for spills and leaks.
3. Identify spill and leak potential for decomposition hazards.
4. Apply information acquired to effect a safe cleanup operation.

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Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 4

Outline

I. Spill and leak detection depends upon employee observation and regular inspection procedures.

  A. Large spills or leaks of liquids in frequently traveled areas are readily apparent.

  B. Large spills or leaks in infrequently traveled areas may go undetected and should be subject of routine detection inspection.

    1. Unscheduled inspections should be conducted when unusual fluid levels, pressure system changes or odor presence is observed.

    2. Each employee should know the area of his investigative responsibility.

  C. Small spills and leaks of liquids can be detected by several methods.

    1. Good housekeeping facilitates early observation.

      a. Contaminated, cluttered areas mask small emissions.

      b. Observer in a disorderly environment becomes accustomed to irregularities.

    2. Frequent inspections keep "normal" conditions more clearly defined for observer.

      a. Habituation to regular inspection sharpens visual and olfactory senses.

      b. Observation of fine detail becomes more sharply focused.

II. Spills and leaks which are not immediately correctable should be promptly reported so appropriate actions may be taken.

  A. Employee observing spills or leaks should be aware of his assessment responsibilities.

    1. Reporting is necessary if condition cannot be rectified without normal work procedure interruption.

2. Reporting leaks of any size is necessary if condition is not rectified with routine adjustments.

3. Any spill of a magnitude which cannot be immediately contained and corrected must be reported to the appropriate agency of the U.S. Government of Discharge of Oil or Hazardous Substances.

    a. Report name, address and telephone number of person reporting.

    b. Report exact location of spill.

    c. Report company name and location.

    d. Report material spilled.

    e. Report estimated quantity.

    f. Report source of spill.

    g. Report cause of spill.

    h. Report name of body of water involved, or nearest body of water to the spill area.

    i. Report action taken for containment and cleanup.

B. Reporting procedure should be clearly defined for employees.

1. Observations should be specific.

    a. Source, if known, should be noted.

    b. Substance should be identified.

    c. Magnitude should be specified.

2. Appropriate supervisory personnel needs to be informed.

3. Co-workers who may be affected should be alerted.

C. Follow-up is a necessary part of first report.

1. Allowing sufficient time for correction, situation needs to be reassessed.

2. If condition persists, reporting procedure needs repetition and emphasis.

III. Spill and leak cleanup methods vary with amount of substance requiring recovery.

  A. Small spills and leaks may be cleaned up with absorbent paper or compound.

    1. Ignition hazards should be eliminated.

    2. Ventilation should be insured.

    3. Prescribed personal protective equipment should be used if substance requires it.

    4. Substance should not be blotted with sawdust.

  B. Large spills and leaks dictate more complex cleanup procedures.

    1. Area should be cleared of all personnel.

    2. Proper governmental authorities should be notified immediately and advice requested.

    3. Emergency response personnel should reenter area only when prescribed personal protective equipment needs are met and hazard magnitude assessed.

    4. Maximum ventilation should be achieved.

    5. All ignition hazards must be eliminated.

    6. Substance should be blocked from entering any drains.

    7. Fire department should be alerted regarding recovery operation.

    8. Recovery of substance must be directed by recognized safety and emergency personnel.

IV. Spill and leak waste disposal is dependent upon quantity of material involved.

  A. Small spill or leak waste materials require proper containment.

    1. Suitable temporary containers must be clearly marked, made of metal and fitted with covers.

    2. Corrosive materials should be treated as per safety data instructions.

    3. Waste containers must be emptied daily.

Submodule 4 (Cont'd)

4. Sewer or sanitary facilities should not be used for dumping unabsorbed liquids.

5. Final disposition of wastes is responsibility of management safety personnel.

B. Large spill or leak waste materials receive special treatment.

   1. Materials may be recycled after collection.

   2. Non-recyclable materials are disposed of by strictly prescribed methods.

      a. Materials may be subject to controlled decomposition processes.

      b. Materials may be specially packaged for sanitary landfill disposal.

      c. Special permission must be obtained for sanitary landfill disposal.

      d. Materials must be properly warehoused until disposal is accomplished.

Hazardous Substances

Recognition and Use of Paints and Solvents

Submodule 4

Spills and Leaks

Instructor's Narrative

Opening remarks: Spills and leaks of paints and solvents result from a variety of circumstances. Small spills and leaks, while presenting hazards of fire and toxic exposure, do not require the manpower, equipment and technical skills for cleanup that are necessary when large disabling emissions occur. Detection and accurate reporting are essential to facilitation of cleanup. Knowledge of substance fire and toxic properties is paramount.

I. Instructor should stress methodical, complete observation reporting techniques. As a guide for small and large spill cleanup comparisons, it is suggested that Volume 40, Number 90 of the Federal Register, May 8, 1975, be used. The topic, "Toxic Substances; Ketones", treats the subject in detail. Ask learners to describe their own job site potentialities for spill and leak occurrence.

II. After discussion of outline points, ask three class members, (1), (2) and (3), to step out of the room. Create a hypothetical spill or leak situation. Ask (1) back and appoint a person (4) to describe the occurrence. Call (2) back and have (1) report situation to (2). Call (3) back and have (2) explain situation to (3). At conclusion repeat original description and compare changes which have taken place from (4) to (1) to (2) to (3). How accurate was the reporting?

III. Use safety data sheets to guide discussion through outline. Re-evaluate safety data sheets for spill and leak instructions on specific substances.

Make use of Federal Register information cited in Part I. Draw learner into an awareness of steps to be taken for cleanup of large spills.

1. Detect
2. Report
3. Shutdown
4. Remove ignition sources
5. Ventilate
6. Select protective equipment

7. Contain

8. Expedite cleanup

IV. As in other parts of this submodule, the instructor should rely on substance specific information available in safety data sheets. Spill and leak waste disposal must be tailored to meet strict requirements for environmental protection.

MODULE I CONCLUDING EXERCISES
(Instructor's Guide)

1. Ask students to mark a sheet of paper with a column of numbers to correspond to in-plant slide set shown in Submodule 1.
2. Show original slide set of work place and ask students to use paper to note their observations, negative or positive, without audible comment. Allow sufficient time for examination of each slide.
3. Review slides and ask students to contribute their observations for comparison and discussion.

Alternative

1. Select two or more representative safety data sheets of the group used for teaching.
2. Ask the group to divide into two subgroups.
3. Ask each subgroup to create their own emergency spill situation.
4. Have subgroups exchange situations and cope with the situations either by role play, panel or individual presentation.
5. Allow each originating subgroup the opportunity to critique the respondents.

Post-Evaluation

1. Administer post-module evaluation.
2. Ask for final comments.

Hazardous Substances

Recognition and Use of Paints and Solvents

Evaluation

Directions: Match Column B with Column A.

Column A

__ 1. The maximum allowable worker exposure limit to a substance in p.p.m. in any 8-hour shift.

__ 2. Immediate or long-range physical danger.

__ 3. Substance having a flash point at or above 140°F.

__ 4. Substance readily releasing oxygen or other combustion supporting gas.

__ 5. Chemical group to which a substance belongs.

__ 6. Material which causes destruction of human tissue or reacts readily with steel or aluminum.

__ 7. Process by which a substance is transformed into other, different substances upon heat exposure.

__ 8. Lowest percent concentration of a substance in air which will ignite.

__ 9. Burning paper, wood or cloth.

__10. Liquid capable of dissolving other liquids or solids.

__11. Substances which can cause injury or illness in man.

__12. Weight of a substance in vapor form compared to weight of air.

__13. Health hazard degree warning.

__14. Temperature at which a substance releases vapor bubbles and forces them into the atmosphere.

__15. The force molecules of a substance exert on the atmosphere to escape as a gas.

__16. The percent, by volume, of a substance which will evaporate.

__17. Symbol indicates water should not be used in fire extinguishing.

__18. Substances having a flash point below 100° F.

__19. Temperature at which substance releases vapors sufficient to be ignitable.

__20. Burning grease, oil, gasoline or other petroleum products.

__21. Vaporization of a solid.

__22. Substances with flash points at or above 100° F and below 140° F.

__23. Solubility of liquids in liquids.

__24. Fire hazard warning.

__25. Weight of a substance as compared to equal volume of water.

Column B

a. Flammable Class I
b. Sublimation
c. Specific gravity
d. Miscible
e. TLV
f. Volatility
g. Flammable Class II
h. Flammable Class III
i. Hazard
j. Poison
k. Corrosive
l. Oxidizer
m. NFPA Blue Diamond
n. NFPA Red Diamond
o. NFPA ~~W~~
p. Boiling point
q. Thermal decomposition
r. Flash point
s. Class A Fire
t. Class B Fire
u. L.F.L.
v. Vapor density
w. Solvent
x. Vapor pressure
y. Chemical family

Hazardous Substances

Module I in Four Submodules

Recognition and Use of Paints and Solvents

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HEALTH CONSIDERATIONS IN THE USE OF PAINTS AND SOLVENTS
HAZARDOUS SUBSTANCES

MODULE II

Prepared for

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Office of Planning and Programming
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Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Module II in Four Submodules

Introduction

This module is to be presented in four submodules addressing:

1. Recognition of Toxicological Properties of Substances.
2. Control Measures and Use of Personal Protective Equipment.
3. First Aid.
4. Problem Solving for Work Environment.

Module design has been guided by the premise that an employee who possesses fundamental understanding of substances encountered in the course of daily work will be a company asset. The informed employee will be more able to recognize potentially hazardous situations and institute appropriate remedial and protective measures and/or accurately report situations to the supervisor. This awareness will reflect directly on cost savings, both in man-hours and materials.

Presentation methods combine lecture - discussions supplemented by visual aids and handout materials - with controlled demonstrations and information interpretation sessions.

The learner will be directed through course material in a positive, how-to manner stressing cost reduction, increased job efficiency and expanded individual observation capabilities.

Educational materials distributed to the learner make no reference to regulatory legislation or employer-supplier liability. The materials used will convey specific health information related to the handling and use of hazardous substances.

Safety is not addressed directly as a formal topic. The rationale being the information conveyed will raise the awareness level to enable the individual to recognize potential hazards and maintain safe working practices.

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Module Objectives

The learner should be able to:

1. Interpret the health related information on the material safety data sheet.
2. Identify toxicological properties of paints and solvents.
3. Select personal protective equipment appropriate to the situation.
4. Administer basic first aid in an emergency.
5. Recognize situations that are potential hazards.

SUMMARY

Hazardous Substances Training Module II
Health Considerations in the Use of Paints and Solvents

Between February 28, 1977, and March 10, 1977, Module II - Health Considerations in the Use of Paints and Solvents - was pilot tested with a group of fifteen employees of a cooperating plant. Each of the four submodules was presented in separate two-hour sessions.

A pretest was administered at the beginning of Submodule 1 and a post-test was administered at the conclusion of Submodule 4.

Pilot Learners were all foremen involved in work areas utilizing paints, solvents and related products in applications including spray painting, electrostatic spray painting, touch-up hand spray painting and degreasing. These people came to Module II directly after Module I. Attendance was still basically involuntary but less apathetic. However, it could be expected that if Module II was not preceded by Module I, the attitude would undergo a marked reduction due to the compulsory attendance and the nature of the material. Reflective of overall attitude and subsequent learning was the continued growth in participation through questions, comments and general discussion.

Pretest results were very low. Tabulation of correct response frequency rendered a mean score of 14.44%.

Submodule 1, Recognition of Toxicological Properties of Substances, was presented in lecture format with use of slides and overlays as supplements. As terms and definitions were presented learners were initially experiencing difficulty with the material but as the terms were expanded upon, more positive attitudes were encountered.

Submodule 2, Control Measures and Use of Personal Protective Equipment, was presented through lecture, slides, equipment demonstration and discussion. There was much involvement through discussion in regard to present practices from Submodule 1. Learners were interactive in information gathering and problem solving. Questions were asked regarding availability of Material Safety Data Sheets for foremen, general properties of solvent families and specific properties of paints and solvents being used in the cooperating plant's factory complex. Questions were also raised concerning other materials (caulking, sealers and glues). The group was receptive to the instructor's request for label and placard observation prior to next session, Submodule 3.

Submodule 3, First Aid, was presented through lecture, slides, film, demonstration and return demonstrations. The group was responsive and enthusiastic during this session. Many pertinent questions were raised and there was a readiness for involvement in the return demonstrations. Requests were made for additional information relevant to first aid procedures.

SUMMARY

Submodule 4, Problem Solving for Work Environment, was presented through the use of situational problems to be solved by the learners followed by group discussion and interaction amongst the group. At this point, their comments revealed an application of the knowledge gained throughout and their efforts at implementation which is going to be limited because of their lack of decision-making and policy implementing authority.

Post-test results based on tabulation of correct response frequency revealed a raw score net gain of 21%.

Based upon the pre- and post-tests, attitudes displayed by the participants, contributions during class discussion, questions raised in class, requests for additional information and learner evaluations, it is possible to arrive at the following conclusions:

1. There was a significant growth in the learner's data base.
2. The learner's awareness level was raised in regards to recognizing potential health hazards prior to becoming a problem and being alert to worker complaints indicative of existing problems.
3. The learner's awareness level was raised to the point of questioning current practices as to their adequacy or inadequacy in providing a safe working environment.
4. Ability to establish priorities in the presence of existing health hazards was improved.

Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 1

Recognition of Toxicological Properties of Substances

Submodule 1

Objectives

Upon completion of Submodule 1, the learner should be able to:

1. Classify substances according to chemical family.
2. Define threshold limit value.
3. Identify the routes by which hazardous substances enter the body.
4. Recognize the health hazards and toxicities caused by exposure to paints and solvents.
5. Interpret the health related information on the safety data sheet.

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Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 1

Recognition of Toxicological Properties of Substances

Outline

I. Discussion of toxicology requires an understanding of certain terminology.

   A. Solvent is a liquid substance capable of dissolving or dispersing one or more other substances.

   B. Threshold limit value (TLV) is the maximum allowable level of air concentration of hazardous substances measured in parts per million.

   C. Vapor is the gaseous form of a substance that is usually in the solid or liquid state.

   D. Respiratory tract includes the upper airway structures and the lungs.

   E. Central nervous system consists of the brain and spinal cord.

   F. Dermatitis is an inflammation of the skin resulting from contact with an irritating substance.

   G. Overexposure refers to exposure above the threshold limit value.

   H. Eight-hour time weighted average is an employee's exposure to a material in any 8-hour work shift of a 40-hour week.

   I. Acceptable ceiling concentration indicates a limit above the eight-hour time weighted average to which a worker can be exposed for a specified period of time as long as the total eight-hour time limit weighted average is not exceeded. In some instances, this is never permissible.

   J. Toxicity refers to the physiological, biochemical or anatomical alterations which result from exposure to hazardous substances and may or may not be reversible.

   K. A hazard may be defined as exhibiting dangerous properties that may be physical or physiological in nature.

II. Chemical families provide a means of categorizing substances.

   A. Aliphatic hydrocarbons are derived almost exclusively from petroleum or petroleum processing.

B. Aromatic hydrocarbons are based upon benzene and molecules which incorporate one or more benzene rings.

   1. Both coal and petroleum derived aromatics are produced in ways which lead to complicated mixtures of many compounds in this series.

   2. Crude distillates and unpurified products may contain substances not indicated on the label, which usually reflects only the principal constituents.

   3. The impurities have been important causes of toxic reactions.

C. Alcohols are used as solvents and thinners for lacquers.

D. Chlorinated hydrocarbons are widely used because of their excellent solvent properties, their relative inexpensiveness and nonflammable characteristics.

E. Ketones are widely used as solvents and degreasers.

F. Esters are used as solvents for lacquers.

III. Workers need to be aware of the toxicological considerations related to the chemicals they are handling.

A. Threshold limit values are the indicators for safe working conditions.

B. Vapors gain entry to the body by various routes.

   1. The major route is through the respiratory tract.

   2. Some absorption occurs through the skin.

   3. Toxicity may result from direct ingestion of chemicals in the industrial setting.

C. Absorption of chemicals causes special concern for several of the body systems.

   1. The mucous membrane that lines the respiratory tract is highly sensitive to irritating vapors.

      a. Mild to severe irritation may result from air concentrations above the threshold limit value.

      b. Chronic toxicity results from prolonged and repeated overexposure.

   c. Respiratory arrest may manifest itself in a highly toxic atmosphere.

2. Central nervous system depression occurs with exposure above the threshold limit value with most of the solvents.

   a. Symptoms may include dizziness, drowsiness, decreased coordination, headache and irritability.

   b. Diagnostic efforts are complicated by the non-specific nature of the symptoms.

   c. Workers may become symptomatic at conditions meeting TLV specifications if they are excessive users of alcohol or on tranquilizing medication.

3. Dermatologic considerations range from corrosive to not noticeably irritating.

   a. Initial action is one of defatting the skin and removal of protective oils.

   b. Skin becomes dry and cracked.

   c. Inflammation occurs as the process continues.

   d. The final stage results in infection because the natural barriers have been removed and a direct route of bacterial entry provided through the open skin.

4. The conjunctiva and cornea of the eye are susceptible to injury.

   a. Consequences of exposure to vapors may range from discomfort to irritation but generally not cause for concern.

   b. Direct contact with solution should always be considered a medical emergency.

5. Liver disease occurs as a result of repeated overexposure to a selected few chemicals.

6. Cardiovascular effects can occur with overexposure to selected substances.

7. Infrequent reports indicate kidney disease as a toxicological consideration.

Submodule 1 (Cont'd)

D. Pre-employment physicals are indicated where there is exposure to chemicals that produce a toxic effect on a body system or rely on detoxification and excretion of the chemical.

IV. Some generalizations can be made regarding chemical families of substances.

A. Aliphatic hydrocarbons produce symptoms from inhalation and dermal exposure.

1. Inhalation produces systemic effects and manifests itself through central nervous system symptoms, such as headaches, vertigo and behavior characterized by giddiness.

2. Dermal exposure to solution serves as a primary irritant effecting a defatting process.

3. Ingestion extremely rare and the danger is not inherent to the swallowing of the substance but rather to subsequent vomiting and almost certain aspiration which causes respiratory paralysis or cardiac arrest.

B. Aromatic hydrocarbons are represented by chemicals with extremes of toxicity ratings.

1. Benzene is considered to be highly toxic with a TLV of 10 p.p.m.

a. "Benzol jag" is a relatively common term among benzene workers.

b. Euphoria, unsteady gait and confusion are symptoms of the effects on the central nervous system.

c. High doses of benzene depress the central nervous system further.

d. Chronic poisoning from repeated overexposure results in disturbance of the blood-forming system.

2. Toluene appreciates a relatively low toxicity with a TLV of 200 p.p.m.

a. Central nervous system effects such as headaches, giddiness and undue fatigue are useful criteria in identifying unsafe exposure.

b. Skin contact produces a temporary burning and stinging sensation.

C. Chlorinated hydrocarbons have a relatively low toxicity but due to their high volatility can precipitate a condition of overexposure rapidly.

  1. Inhalation results in systemic effects of headache, fatigue, impaired memory, irritability, nausea, anorexia and general central nervous system depression.

  2. Dermatological considerations include defatting, fissuring and infection.

D. Alcohols present toxic problems as a result of ingestion.

  1. The vapors are generally nontoxic in nature.

  2. Methanol ingestion can result in blindness or death.

    a. Metabolism of methanol produces formic acid and formaldehyde.

  3. Ethanol ingestion produces a narcotic, depressant effect. (Emphasize that this is not drinking alcohol!)

E. Ketones exhibit some general characteristics.

  1. Vapors are irritating to the eye.

  2. Mucous membranes of the upper respiratory tract become irritated.

  3. Narcotic effects can be observed.

  4. Dermatitis is the product of repeated and prolonged contact.

  5. Detoxification processes result in damage to the liver and kidneys.

F. Esters display some commonalities.

  1. Conjunctivitis has been observed.

  2. Irritation of the upper airway is produced.

  3. Contact causes defatting of the skin.

Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 1

Instructor's Narrative

I. Suggest use of handout of terminology for the students.

A. The organic solvents used in industry have degreasing properties. These degreasing properties are effective not only as cleaners but also serve to defat (degrease) the worker's skin when contact occurs. In fact, effectiveness as a solvent has a direct relationship to the expected degree of skin irritation.

B. Threshold limit values can best be explained by using an example: the acceptable air concentration of toluene is 200 p.p.m.; others have a much lower TLV, such as benzene which is listed at 10 p.p.m.

HIT-1 - diagram representing air concentration of toluene and benzene at the threshold limit values.

HIT-2 - information about the threshold limit value can be found on the material safety data sheet.

HIT-3 - most of the solvents have some effect on the mucous membrane of the respiratory tract. This will vary with substances and level of air concentration.

E. HIT-4 - transparency depicting the components of the central nervous system.

F. Dermatitis can be further categorized into single contacts which are classified as primary irritants and repeated prolonged contacts which are classified as sensitizers.

I. Using benzene again, which has an 8-hour TWA of 10 p.p.m., the acceptable ceiling concentration is 25 p.p.m. never to exceed 50 p.p.m. The maximum allowable exposure between 25 - 50 p.p.m. is 30 minutes.

HIT-5 - Sample TWA determination.

2 hrs. @ 5 p.p.m.
2 hrs. @ 10 p.p.m.
3 hrs. @ 15 p.p.m.
1/2 hrs. @ 30 p.p.m.

$$\frac{2 \times 5 + 2 \times 10 + 3 \times 15 + 0.5 \times 30}{8} = 11.25 \text{ above TWA}$$

Substances with such a low TLV do not allow much variation in exposure levels.

This situation is presented only to demonstrate to the worker that there may be limited safe variations from the TLV reported on the safety sheet.

J. Toxicity ratings may vary according to scale being referenced.

One example of a scale is as follows:

(1) extremely toxic.
(2) highly toxic.
(3) moderately toxic.
(4) slightly toxic.
(5) practically nontoxic.
(6) relatively harmless.

H1T-6 - toxicity rating scale.

II. A. Chemicals representative of this family that we will be predominantly concerned with are solvent mixtures such as petroleum ether, benzine, petroleum naphtha, mineral spirits, stoddard solvents and varsol.

B. Representative chemicals in this group are benzene, xylene and toluene.

C. The principal substances that will be discussed here are ethanol and methanol.

D. Examples of substances in this family include dichloromethane (methylene chloride), 1,1,2 - trichloroethane (vinyl trichloride) 1,1,1 - trichloroethane (methyl chloroform), trichloroethylene (acetylene trichlorede, trichloroethylene), tetrachloroethylene (perchloroethylene), and perchloroethane.

The extreme similarity in spelling of the chemicals represented here points out the importance of accessibility to a reference source of information. It would be an almost insurmountable task to maintain clear distinction of all chemicals and their properties that are being used in any given industry.

E. Acetone, methyl ethyl ketone (MEK) and methyl isobutyl ketone (MIKB) are among the more frequently identified solvents in industrial use.

F. Examples include ethyl acetate and butyl acetate.

Submodule 1, Instructor's Narrative (Cont'd)

III. B. H1T-7 - Routes of entry.

1. H1T-8 - Depicts a person breathing in vapors resulting in contact with the mucous membrane lining of the respiratory tract.
2. H1T-9 - Enlarged diagrammatic illustration of components parts of the skin structure.
3. H1T-10 - Pictorial of ingestion.

C. 1. H1T-11 - Diagrammatic of respiratory tract.

2. H1T-12 - Diagrammatic of central nervous system.
3. H1T-13 - Diagram of skin with cracking of surface layer depicting the ready access to bacteria.

Ask the participants to evaluate their own hands and the hands of other participants or the workers they supervise.

Suggested learning activities to be utilized after Submodule 1 is completed:

> Questionnaire of health related information to be observed and recorded and discussed at the next class.

Terminology
(Handout)

Solvent is a liquid substance capable of dissolving or dispersing one or more other substances.

Threshold limit value (TLV) is the maximum allowable level of air concentration of hazardous substances measured in parts per million.

Vapor is the gaseous form of a substance that is usually in the solid or liquid state.

Respiratory tract includes the upper airway structures and the lungs.

Central nervous system consists of the brain and spinal cord.

Dermatitis is an inflammation of the skin resulting from contact with an irritating substance.

Overexposure refers to exposure above the threshold limit value.

Eight-hour time weighted average is an employee's exposure to a material in any 8-hour work shift of a 40-hour week.

Acceptable ceiling concentration indicates a limit above the eight-hour time weighted average to which a worker can be exposed for a specified period of time as long as the total eight-hour time limit weighted average is not exceeded. In some instances, this is never permissible.

Toxicity refers to the physiological, biochemical or anatomical alterations which result from exposure to hazardous substances and may or may not be reversible.

A hazard may be defined as exhibiting dangerous properties that may be physical or physiological in nature.

Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 2

Control Measures and Use of Personal Protective Equipment

Submodule 2

Objectives

Upon completion of Submodule 2, the learner should be able to:

1. Identify the environmental control measures provided by management.
2. Identify the types of personal protective equipment provided by management.
3. Identify the employee's responsibility for proper protection.
4. Select appropriate personal protective equipment when handling hazardous substances.
5. Identify the hygienic factors that protect the employee, fellow workers and family members.

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Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 2

Control Measures and Use of Personal Protective Equipment

Outline

I. Management through engineering provides environmental controls in work situations utilizing hazardous substances.

   A. Mechanical exhaust systems draw vapors and fumes away from worker's breathing zones.

   B. Overspray collection and filter systems remove contaminants from exhaust air flow.

   C. Potential ignition sources are properly shielded or automatically controlled.

   D. Hoods and controlled entries confine dispersement of vapors.

II. Management provides personal protective equipment for use in special circumstances.

   A. Mechanical control breakdown requires use of personal protective equipment.

   B. Spill or leak discharges require use of personal protective equipment.

   C. Maintenance procedures on ventilation equipment require use of personal protective equipment.

   D. Substance application without adequate ventilation requires use of personal protective equipment.

III. Employees must assume responsibility for proper utilization of personal protective equipment.

   A. The employee needs to maintain a constant awareness of potential hazards even during automatically controlled operations.

   B. All employees should know when and how to use personal protective equipment if needed.

   C. Employees should know checkpoints to be observed as a part of standard and emergency procedures.

IV. Equipment selection depends upon substance properties.

- A. Skin contact with solvents and paints may cause irritation leading to a condition called dermatitis.
  - 1. When handling hazardous liquids, employees should wear gloves that are impervious to such liquids and long enough to protect the forearms.
    - a. Polyvinyl alcohol glove material protects against aromatic and chlorinated hydrocarbons.
    - b. Polyvinyl alcohol glove material must be kept away from acetone alcohol and other material miscible in water to prevent deterioration.
  - 2. Skin that is not covered by clothing should be protected by special barrier creams.
  - 3. Skin cleansing should be accomplished only with materials specifically designed for use on the skin.
  - 4. When accidental skin contact with solvent occurs, the area should be immediately and thoroughly washed with soap and water.
  - 5. If clothing becomes saturated with solvent.liquid, remove clothing and shower.
- B. Eye protection is required where there is possibility of eye injury from splashes.
  - 1. Shielded safety glasses provide some splash protection.
  - 2. Safety goggles provide both splash and vapor protection.
- C. Respirators are designed to protect against specific hazards.
  - 1. Gaseous exposure can be classified into two categories with respiratory protectior specific to each category.
    - a. Some conditions present an immediate life threatening situation.
      - (1) These conditions can be identified by awareness of substances at the work place and the properties of those substances.
      - (2) A self-contained breathing apparatus, a hose blower with mask and gas masks are appropriate protective devices.

b. There are other conditions that are not immediate life threatening situations.

    (1) These conditions can be identified by awareness of substances at the work place and the properties of those substances.

    (2) An airline respirator, a hose mask with blower and a chemical cartridge respirator are appropriate protective devices.

2. Gaseous and particulate exposure can be classified into two categories with respiratory protection specific to each category.

    a. Some conditions present an immediate life threatening situation.

        (1) These conditions can be identified by awareness of substances at the work place and the properties of those substances.

        (2) A self-contained breathing apparatus, a hose blower with mask and gas masks with special filters are appropriate protective devices.

    b. Other conditions are not immediately life threatening.

        (1) These conditions can be identified by awareness of substances at the work place and the properties of those substances.

        (2) An airline respirator, a hose mask without blower and a chemical cartridge respirator with a special filter are apprpriate protective devices.

V. Employees are responsible for personal hygienic practices that protect themselves, their fellow workers and their families.

A. At the end of each day's use, respirators should be taken apart, washed, dried and defective parts replaced.

B. Two people should never wear the same respirator unless it has been cleaned and disinfected between use.

C. Employees working with hazardous substances should wash and remove contaminated clothing before eating, drinking or smoking.

D. Clothing that is contaminated with hazardous substances should not be laundered with other clothing!

Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 2

Control Measures and the Use of Personal Protective Equipment

Instructor's Narrative

Review: Discuss health data collected since the last class, how it relates to the last class, how it relates to the work environment and the implications for the worker.

Opening remarks: Emphasis should be placed on the fact that day-to-day operations will usually be controlled by engineering practices. The information presented under Personal Protective Equipment is designed to prepare the worker for those situations that are defined as needing additional protection. It is in no way intended as a scare tactic or to cause the worker to be overconcerned about daily routine functions.

II. A. In the event of mechanical ventilation failure, P.P.E will be necessary to not only continue operations but also to repair the system.

B. Overexposure should not be chanced during cleaning operations in the event that a spill or leak occurs. Substances vaporize at different rates and the toxic properties vary. Unnecessary exposure should never be permitted.

C. When repairs are necessary on the ventilation system, procedures to protect against the collected vapors and substances should be implemented prior to initiating the repair process.

D. All touch-up spray operations should be accomplished only with the use of recommended personal protection equipment.

Rationale for use of personal protective equipment is difficult to impress upon the worker. Effects from exposure may not be readily noticeable because they are cumulative and are not obviously manifest for a period of years. This is typified by the younger worker who is physically strong, in good health and "immune" to the afflictions of the "older worker."

IV. A. 1. H2S-1 - H2S-2 - Show examples of gloves and discuss the matching of capabilities of the gloves with the substance being used.

2. H2S-3 - Show examples of barrier creams and discuss the matching of the capabilities of the cream to the substance being used.

3. H2S-4 - H2S-5 - Show examples of suitable skin cleansers.

B. 1. H2S-6 - Show examples of safety glasses and goggles. Discuss the importance of proper fitting for effectiveness.

2. H2S-7 and H2S-8.

C. It is suggested that the various types of respirators be discussed using examples and pointing out the capabilities of each one.

1. H2S-9 - Disposable paper mask.
2. H2S-10 - Chemical cartridge respirator.
3. H2S-11 - Chemical cartridge with face mask.
4. H2S-12 - Gas mask.
5. H2S-13 - Airline respirator.
6. H2S-14 - Paint hood over airline respirator.
7. H2S-15 - Self-contained breathing apparatus.

D. H2T-1 - Transparency of flow chart showing selection of respirators according to contaminant and life threatening situation.

Handout of same flow chart.

Repeat slides of respirators using them as a test to see if they can identify types of respirators.

V. A. Demonstrate disassembly, cleaning and reassembly of respirators. Have students do return demonstrations.

C. H2T-2 - Transparency of worker eating in a contaminated area. Discuss practices carried out in reality by workers on the job.

Suggested learning activity:

Ask the students to identify the types of personal protective equipment supplied for their use and the location of that equipment.

Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 3

First Aid

Submodule 3

Objectives

Upon completion of Submodule 3, the learner should be able to:

1. Identify the employee's responsibility to himself when an exposure to a hazardous substance occurs.
2. Identify appropriate action for overexposure by inhalation of hazardous substances.
3. Identify appropriate action for dermal exposure to hazardous substances.
4. Identify appropriate action for ingestion of hazardous substances.
5. Identify appropriate action for eye contact with hazardous substances.
6. Identify appropriate action for exposure to hazardous substances resulting in central nervous system depression.
7. Identify an employee's responsibility to other personnel when an exposure to a hazardous substance occurs.

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Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 3

First Aid

Outline

I. First Aid administered at the scene is provided by trained or untrained personnel and limited in nature.

  A. Remove the worker from the area of contamination.

  B. Decontaminate the skin and eyes.

  C. Assess the person for adequate breathing.

  D. Transport the victim to medical care.

II. Inhalation exposure warrants immediate action.

  A. Remove the worker to fresh air.

    1. Attempt rescue only after assuring that the rescuer has the necessary respiratory protection.

    2. Notify someone else before going in to rescue a victim and then do so only with the aid of a rescue line.

    3. The respirator used should be a self-contained breathing apparatus.

      a. Gas masks do not protect against insufficient atmospheric oxygen supplies.

      b. If chemical vapors are above a 2% concentration level, a gas mask is not efficient.

    4. Rule: Do not become a victim yourself.

    5. Initiate rescue breathing if respiration is absent.

    6. Transport victim to first aid station.

    7. Determine the substance to which the person was exposed.

    8. Definitive first aid can be administered by trained personnel at first aid station.

      a. Resuscitative efforts should be continued as long as the person fails to breathe spontaneously.

b. Oxygen can be administered if equipment is available and the personnel are familiar with its operation.

c. If the person is conscious keep him/her quiet and resting.

d. Gently restrain if confusion or disorientation require it.

e. Call the physician.

f. Transport to the hospital by ambulance.

g. Information should accompany the victim to the hospital regarding the name of the substance he/she was exposed to and any other data about the substance.

III. Skin afflictions are usually experienced as primary irritations.

A. Most successful treatment is prevention.

B. All workers should know where the showers are located.

C. Flush the area with water.

D. Remove contaminated clothing.

E. Wash area with a mild detergent and flush again with water.

IV. Eye contact may occur from exposure to vapors or liquids.

A. Exposure to vapors of most solvents will not produce eye injuries.

B. Splashes should be treated immediately.

1. All workers should know where the eye wash fountain or suitable substitute is located.

2. Flush the eye with large amounts of running water for a minimum of five minutes.

3. Identify the substance to which the person was exposed.

4. Transport the person to the first aid station for further care.

V. Central nervous system depression necessitates removal of the person from the contaminated area.

A. Symptomatology is wide and varied.

1. Headache, dizziness and fatigue are among the milder manifestations.

2. More severe effects are light anesthesia and marked depression.

3. Muscular coordination and strength may be altered.

B. Effects are usually reversible.

C. Determine the degree of CNS depression.

D. Do not allow the person to drive.

E. Do not allow the person to return to work if performing a highly skillful or dangerous job.

VI. Victims of ingestion are rare in industry.

A. Determine the substance ingested.

B. Establish contact with the Poison Control Center.

C. Induce vomiting unless contraindicated or the person is unconscious.

1. Stroke the back of the throat.

2. Administer a glass of water containing a tablespoon of salt.

D. Transport the person to the first aid center.

E. Take the product that was ingested along when transporting victim to first aid center of hospital.

F. Prevent aspiration of vomitus if the person is unconscious.

Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 3

First Aid

Instructor's Narrative

Review: Discuss the personal protective equipment located in their work area, where it is located and familiarity with its use.

Opening remarks: The principles of first aid that are presented will be limited to those procedures that can be carried out at the scene with minimal resources. It is intended that the worker with some fundamental knowledge can initiate action until more highly trained personnel arrive.

I. Initial efforts will focus on assessment of the situation and administering to whatever needs are life threatening or have potential of producing permanent injury.

II. Stress the assessment of the situation not only from the vantage point of the victim but also in terms of safety for the rescuer.

A. 1. This emphasizes the necessity of having respirators and other protective equipment in close proximity to the work station. Valuable time is sacrificed if search efforts are required to locate the necessary materials in order to initiate rescue procedures.

2. A rescue team should be composed of a minimum of two members. One person remains outside of the area that is immediately dangerous as a backup and the other proceeds with rescue efforts. In the event that rescue is taking place in a confined area, such as a tank, a rescue line must be utilized upon entering the tank.

5. Because the materials used in a painting operation have varying degrees of toxicity to the respiratory tract, there will be references made to rescue breathing, and this subject will be treated in more detail at a later point.

7. It is absolutely essential that the substance of exposure be identified in order to anticipate further medical problems and to facilitate the physician's role in providing adequate care and treatment.

8. Demonstrate principles of rescue breathing and have students perform return demonstrations.

Film: Breath of Life
Iowa Heart Association

Slide Series: Rescue Breathing
Slide Set
Iowa Heart Association

Handout - Rescue Breathing -
Discussion Guide
Iowa Heart Association

III. B. H3S-1 - Emergency shower.

IV. Include demonstration of eye wash procedure and have students perform return demonstrations.

1. H3S-2 - Emergency eye wash fountain.
2. H3S-3 - Portable eye wash fountain.
3. H3S-4 - Eye wash kit.
4. H3S-5 - Combination shower and eye wash.

VI. F. Point out the necessity for placing the victim in a side-lying position to allow vomits to be expelled in the event of such an occasion.

Learning Activity:

Locate the showers and eye wash facilities in your work area.

Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 4

Problem Solving for Work Environment

Submodule 4

Objectives

Upon completion of Submodule 4, the learner should be able to:

1. Establish priorities in an emergency situation.
2. Formulate responses to hypothetical situations that can be used for future reference.

Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 4

Problem Solving for Work Environment

Outline

I. Response role play situations increase learner assessment and decision-making skills.

  A. Role play provides vicarious experience for observers.

  B. Role play provides the players with simulated response situations.

  C. Role playing permits all participants to explore solution variations and alternatives.

II. Group dynamics in role play consist of four components.

  A. Initiator has the designated responsibility to have his message understood.

  B. Respondent has need to understand and/or implement message.

  C. Interceptor may or may not be supportive of the message.

    1. He may offer irrelevant information.

    2. He may oppose the message.

  D. Observer may take no part in role play.

    1. He/she must accurately observe group interaction.

    2. He/she shall identify the strengths of initiator.

III. Participants are to be provided with hypothetical situations.

(This portion of the outline is intended for use as an instructor's guide. Groups of four should be formed to implement the learning activities. The instructor may alter the situations in any manner that is suitable for the class participants. In some cases, substitution of discussion groups for role play activities may be necessary.)

  A. Spray painting operations have been shut down due to ventilation system failure. Operations may not be resumed until cleaning of the ventilation system has been completed.

1. Role assignments are made and directions given.
    a. The initiator is a foreman.
        (1) The foreman has the responsibility for decision making and directing.
        (2) The task is to be completed without exposing anyone to undue hazards.
    b. The respondent is a subordinate of the foreman.
        (1) This person has been employed by the company for two weeks.
        (2) The subordinate is in the position of receiving and carrying out orders.
    c. The interceptor is also a subordinate.
        (1) This person has been employed by the company for 20 years and has some definite ideas as to how tasks should be accomplished.
        (2) It will be the function of this individual to run interference contradictory to the foreman's instructions.
    d. The observer will serve as an evaluator.
        (1) Decide the strengths of the foreman.
        (2) Analyze the interaction among the players.
        (3) Critique the solution to the problem.
2. The group will evaluate and critique following the activity.

B. You have just been summoned to the paint booth by a worker who has found the painter collapsed in the booth. Observation of the situation reveals that a hose has ruptured and material is being sprayed into the booth. The paint being used at this particular time is acrylic enamel.

1. Role assignments are made and directions given.
    a. The initiator is a foreman.
        (1) The foreman has the responsibility for decision making and directing.

(2) The task entails moving the unconscious worker to safety and correcting the accident in the paint booth.

b. The respondent is a subordinate.

(1) This is the initial person on the scene.

(2) He/she notifies the foreman.

(3) Directions given by the foreman are to be carried out.

c. The interceptor is a foreman from another area.

(1) This person attempts to take over the leadership role.

(2) All directions given should be in direct opposition to those given by the person in the initiator's role.

d. The observer will perform several functions.

(1) Decide the strengths of the foreman (initiator).

(2) Analyze the interaction among the players.

(3) Critique the solution to the problem.

2. The group will evaluate and critique following the activity.

C. A pressure plumbed system containing xylene is operational when a fitting failure occurs. Operator is drenched with the solvent material.

1. Role assignments are made and directions given.

a. The initiator role is that of a foreman.

(1) The foreman must decide what emergency care is to be administered to the operator.

(2) The foreman also must direct cleanup activities.

b. The respondent role is assumed by a subordinate.

(1) The subordinate is to follow instructions pertaining to the care of the operator.

(2) The subordinate is to follow instructions related to cleanup activities.

c. The interceptor's role will be assumed by the operator.

    (1) The operator becomes hysterical and has to be chased and restrained.

    (2) The operator strenuously resists all first aid attempts.

d. The observer will critique the role playing activity.

    (1) Decide the strengths of the foreman.

    (2) Analyze interaction among the players.

    (3) Critique the solutions.

2. The group will evaluate and critique following the activity.

Hazardous Substances

Health Considerations in the Use of Paints and Solvents

Submodule 4

Problem Solving for Work Environment

Instructor's Narrative

Review: Discuss the first aid materials supplied at the work station.

This submodule is developed strictly as a group learning activity to provide the participants an opportunity to actualize the information to which they have been exposed. The outline provides the necessary details for the instructor to direct the activity. It also allows latitude to adapt the material as the situation demands. Students may bring actual situations to the classroom which they have experienced. The reality and personal touch elements in these situations often stimulate an enthusiasm for participation not present in hypothetical cases.

Written role descriptions for the players would be a useful handout.

Case Study No. 1

A pressure plumbed system containing xylene is operational when a fitting failure occurs. The operator is drenched from head to toe with the solvent material.

You are the foreman and are responsible for directing the activities to provide emergency care and to see that cleanup is carried out safely. Identify all actions that you would take in caring for the operator and cleaning up the area.

Case Study No. 2

You have just been summoned to the paint booth by a worker who has found the painter collapsed in the booth. Observation of the situation reveals that a hose has ruptured and material is being sprayed into the booth.

The paint being used is acrylic enamel.

When you get the painter out of the booth, your assessment of the situation tells you that he is not breathing.

Identify all actions that you would take in caring for the painter and cleaning up the area.

Health Considerations in the Use of Paints and Solvents

Evaluation

Directions - Circle the letter in front of the correct answer (one answer only).

1. Removal of paint from the skin should be done by using

   a. Paint thinner.
   b. The least toxic solvent material available.
   c. Waterless hand cleaner.
   d. Any of the above items.

2. A person who has splashed solvent material into his eyes should be

   a. Referred to the first aid station.
   b. Taken to the doctor.
   c. Given eye drops immediately.
   d. Have eyes flushed with water.

3. Worker's complaints of nausea, headache and sore throat

   a. Indicate that they are being overexposed to hazardous materials.
   b. Indicate that air concentration levels should be measured.
   c. Are probably due to the flu and you can suspect that a number of people will be calling in sick in the next few days.
   d. Are expected effects that have to be lived with because of the materials they use in their jobs.

4. A person who has liver disease and is applying for a job where hazardous materials are used that cause liver toxicity should

   a. Not be hired for that job.
   b. Be supplied appropriate personal protective equipment.
   c. Be warned of the dangers and allowed to make his own choice.
   d. Hired on a trial basis.

5. When the painting process allows paint mist containing solvent vapors to come in contact with the skin in a moderate amount, the painter should

   a. Remain in the paint area a limited amount of time.
   b. Use paint thinner to remove the paint.
   c. Refuse to paint in the area until the problem is corrected.
   d. Use a barrier cream on unprotected skin areas.

Evaluation (Cont'd)

6. When atmospheric concentration of hazardous substances is above the 2% level, adequate protection is provided by a
   a. Chemical cartridge respirator.
   b. Disposable mask.
   c. Self-contained breathing apparatus.
   d. Any available respirator as long as it covers the mouth and nose.

7. Central nervous system depression due to exposure to hazardous substances is characterized in its early stages by
   a. Unconsciousness.
   b. Narcosis.
   c. Sore throat and nausea.
   d. Dizziness, headache and lack of muscle coordination.

8. The time-weighted average is
   a. The acceptable level of exposure to a material in any 8-hour shift of a 40-hour week.
   b. The safe level of exposure to a hazardous material based on a person's weight.
   c. The same as the threshold limit value.
   d. None of the above.

9. The term, route of entry, refers to
   a. The ventilation system.
   b. The means by which hazardous substances get into the body.
   c. The means by which hazardous substances get into the air.
   d. The pathway for the fire department to follow.

10. The disposable mask respirator provides protection against
    a. Paint mists.
    b. Vapors.
    c. Paints and vapors.
    d. All air contaminants in a painting area.

11. The threshold limit value (TLV)
    a. Is overemphasized in its usefulness for maintaining plant safety.
    b. Is useful information only for the safety engineer.
    c. Can be considered a yardstick for a safe working environment.
    d. Should be memorized by workers for each of the materials being used in their area of assignment.

Evaluation (Cont'd)

12. Most paints utilized in spray painting operations

    a. Are free of additional toxic materials.
    b. Contain solvent materials that give off toxic vapors.
    c. Can be used without concern for toxic reactions.
    d. Are too complex to be analyzed for component substances.

13. A substance which causes dermatitis on a single contact is known as

    a. A sensitizer.
    b. A hazard.
    c. A nuisance.
    d. A primary irritant.

14. Substances that cause dermatitis from repeated and prolonged exposure are known as

    a. Carcinogens.
    b. Sensitizers.
    c. Primary irritants.
    d. Hazards.

15. A fire has broken out in the plant and you can see a person lying on the floor unconscious. He is away from the fire but in an area that is heavy with smoke. Your first action will be to (the fire alarm has already been sounded)

    a. Quickly run in and get the person and drag him to fresh air because time is essential.
    b. Put on a respirator designed for smoke-filled atmospheres because your safety is more important than getting the other person out fast.
    c. Call your foreman for directions.
    d. Pray for the fire department to arrive.

16. Respiratory protection during touch-up spray painting operations can be provided by a

    a. Disposable mask.
    b. Self-contained breathing apparatus.
    c. Chemical cartridge respirator.
    d. No protection is required because of the short time of exposure.

17. Methylene chloride is classified as

    a. An aromatic hydrocarbon.
    b. An aliphatic hydrocarbon.
    c. An alcohol.
    d. A chlorinated hydrocarbon.

Evaluation (Cont'd)

18. Toxicity refers to alteration of the body in some manner and may be temporary or permanent in nature.

    a. True.
    b. False.

19. Most workers use the proper precautions when using paints and solvents because they are concerned about the effects of years of exposure to the substances.

    a. True.
    b. False.

20. Accidental drinking of methanol results in

    a. Blindness or death.
    b. Nausea and vomiting.
    c. No real problem, it's just a cheaper grade of alcohol.
    d. Dermatitis.

21. The effectiveness of a solvent in industrial use is directly related to the severity of the degreasing effect it has on skin.

    a. True.
    b. False.

22. Susceptibility to toxicity from hazardous substances is

    a. Decreased by alcohol intake.
    b. Increased by alcohol intake.
    c. Unrelated to alcohol intake.
    d. Affected only in the presence of alcoholism.

23. When the ventilation system is working effectively, it

    a. Provides fresh air.
    b. Removes most of the particulate and gaseous materials.
    c. Provides fresh air and removes particulate and gaseous materials.

24. Eye wash equipment should be a standard part of the first aid supplies in an area that contains barrels of solvent for pick up of smaller amounts to be taken to other areas.

    a. True.
    b. False.

Evaluation (Cont'd)

25. One of the things that should be taken into consideration is that workers who are made aware of the health hazards related to the substances they are using will probably have more complaints of illness.

    a. True.
    b. False.

Hazardous Substances

Module II in Four Submodules

Health Considerations in the Use of Paints and Solvents

References

Federal Register - Department of Labor
Occupational Safety and Health
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